The Builder.

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Sanitary Engineering.

IN our issue of December 31, 1898, we reviewed at length the first edition of Colonel Moore's great work on "Sanitary Engineering," and now, less than three years later, the second edition* lies before us. This is not a mere reprint with minor alterations, but claims to have been "brought thoroughly up to date, so as to maintain the position it has gained as the standard work on sanitary engineering." The first edition formed a bulky volume; the second is still bulkier, containing 791 pages (an increase of 170), 860 illustrations in the text (an increase of 326), and ninety-two "large folding plates" (an increase of twenty-two). The principal additions to the text are in the chapters relating to sewage-purification and refuse-disposal, and in the hydraulic tables, but numerous additions have also been made in other chapters, particularly in those dealing with sewer-ventilation and sanitary apparatus.

In the preface to the new edition Colonel Moore states that "every endeavour has been made to profit by the hints and suggestions which have been received from a variety of sources," and we are glad to find that our own criticisms, almost without exception, have been of service. In the space of a single article it was, of course, impossible to draw attention to every erroneous or disputable statement in such a large work, and we regret to find that many such statements have been carried forward into the new edition, and unfortunately much of the new matter contains similar blemishes. The fact is that Colonel Moore relies too little on his own judgment and too much on that of persons financially interested in the fittings or processes which they recommend. The result is that some of the chapters are very much like merchants' catalogues, the advantages of an apparatus being greatly exaggerated and the defects as carefully concealed as those of a would-be-young old maid. These praises are not always sung within inverted commas, and they go forth to the world, therefore, as Colonel Moore's own deliberate judgment. This is unfortunate for Colonel Moore. There are several examples in chaps. ix. and x. We select one from the former chapter, p. 395. It is a description of a wash-down water-closet, illustrated in plate xxv., but which we will not particularise. The description begins:—"The manufacturers state that this is the only closet the basin of which [can*] be removed from the lead pedestal and trap, so that the plumber has full play to make a plumbing or wiped joint, and thereby doing away with the risky method of soldering a piece of lead pipe to the earthenware trap." Here we have the manufacturers' statement (grammar and all) which the reader will take for what it is worth, but there is nothing to show that the remaining eleven paragraphs (occupying twenty-four lines) are not Colonel Moore's own words. Without search we should not like to offer an opinion as to the correctness of the opening statement *at the time it was written*, although no doubt the manufacturers believed it to be true; but the statement is certainly not correct to-day, as closets with pottery basins and lead traps or half-traps are now made by a number of manufacturers of sanitary fittings. Two such closets with half-traps of lead are illustrated by Colonel Moore on the same plate, and the "Hygienic" closet, which is also illustrated on plate xxv., has been made for about twenty years with a complete trap of iron (as shown) or of lead; the latter form has apparently been forgotten by Colonel Moore, although it is on almost identical lines with that under notice, and is recommended by the inventor for identical reasons. Why, then, does Colonel Moore repeat without qualification the statement which we have quoted? Some of the remaining paragraphs—for all of which Colonel Moore is responsible, as there are no inverted commas—are also highly coloured. We need refer to one only:—"There is also a large surface of water in the basin and a deep water seal in the trap." The illustration is, with the exception of the base of the pedestal, a geometrical section, and is apparently printed from the manufacturers' block. No scale is given, but we may assume that the total height of the fitting is 17 in. or 18 in., and with this as our scale we find the "large surface of water in the basin" to be a circle 3½ in. in diameter, and the "deep water seal in the trap" to be ½ in.! Perhaps the drawing is incorrect, but if this is so, it lies between Colonel Moore and the manufacturers.

This, although a flagrant instance of the indiscriminate copying to which we have taken exception, is only one of many examples in the book, and the new edition is more full of them than the first. Thus, the special drain-pipes of a certain firm were praised in the first edition, but one paragraph was ushered in with the sentence—"The manufacturers state," and the seven special praises came after the words—"The following advantages are claimed for them." In the new edition the description is even more glowing, and has been amplified to twice the original length; but no space could be found for the two principal sentences we have just quoted; and, as if this was not enough, a paragraph has been added which is of such a nature that we quote it in full, with the exception of the proper names:—"Messrs. . . . . manufacture also every description of salt-glazed sanitary ware, in which the far-famed . . . . clays alone are used, thus ensuring only the highest class of impervious product. They make a speciality of 'tested pipes' and of various forms of patent joints, ... &c." We venture to style this "the puff direct."

Chap. vii., on "Ventilation," has been in part re-written, and has been extended from thirty-four to forty-seven pages. Much of the new matter consists of quotations,

* "Sanitary Engineering: A Practical Treatise on the Collection, Removal, and Final Disposal of Sewage, the Design and Construction of Works of Drainage and Sewerage, and the Disposal of House Refuse and Sewage Sludge, with numerous Hydraulic Tables, Formulæ, and Memoranda, &c." By Colonel E. C. S. Moore, R.E., M.San.I., author of "Sanitary Engineering Notes," &c., formerly Instructor in Estimating and Construction at the School of Military Engineering, Chatham. Second edition, revised and enlarged. London: B. T. Batsford. 1901.

* This word is accidentally omitted in the text.

most of which are from the writings of authorities who have no axes of their own to grind, but others are of a less distinguished character. In the first edition there was a reasonable account of an apparatus for extracting and destroying "sewer gas" by means of heat. This reappears in the second edition, but fifteen pages further on a new quotation of two and a half pages begins, the author having the same name as the inventor of the apparatus just mentioned, and arriving at the conclusion that "the most perfect method of extraction is displacement by heat, when the extraction and destruction of the foul gases can be done at one and the same time." What Colonel Moore thinks of the special methods and apparatus which he mentions we are not able to discover; he is apparently content to let the student arrive at an independent conclusion. This is scarcely the part of a guide, philosopher, and friend, such as the author of a large and important work like this ought to be. Not content, however, with leaving to the student the initial difficulty of deciding between the opinions of the various authorities quoted, Colonel Moore has unfortunately rendered the decision more difficult by conflicting statements of his own. On p. 324 we read that sewer-ventilating shafts "not less than 6 in. in diameter are recommended to be led from the manholes, or shafts [*sic*], to the gables of adjoining buildings, or to ventilating lamp-posts." This paragraph and the figure illustrating it are copied exactly from the first edition. As the author does not state by whom this recommendation is given, and as the passage is not in inverted commas, we naturally conclude that the arrangement has his own approval, but in the *new* edition we read on the next page—"Air-shafts connected directly with the public sewer should never be fixed against any dwelling-house or building, nor within at least 20 ft. of any window or chimney." On the page facing this definite dictum is the illustration referred to, showing an exit drain "for foul air," carried from the crown of an egg-shaped sewer to the foot of a ventilation-shaft fixed to the gable-end of a building (apparently a house), and within about 4 ft. of a window. In both editions we are told that "inlets and outlets must, therefore, be considered as possibly acting alternately in any capacity, depending on the amount of friction set up at various times by the flow of sewage." The reason given is quite erroneous, and is now contradicted by a new paragraph on the same page (325), from which we learn that "the power of ventilating-shafts depends entirely on the difference of the pressure of the atmosphere at the outlet and inlet of the shaft, from which a deduction must be made for the loss caused by friction; this varies with the size of the shaft and the nature of the inner surface." In the former statement the "friction set up .... by the flow of sewage" is given as the controlling factor, while in the latter the power of extraction "depends entirely" on atmospheric pressure, modified to a slight extent by the friction of the air *in the ventilation shaft itself*. Colonel Moore's new statement as to the commanding influence of atmospheric pressure is, however, as erroneous as the old one about the friction of the sewage; the tests made by Mr. Horton, to which we referred him, and which he now quotes *in extenso*, ought to have enlightened him. "I have not noticed," says Mr. Horton (p. 349), "that the variation of atmospheric pressure makes any difference." We have not by any means exhausted the contradictions in the new matter inserted in this chapter, but we have said enough to show that the author is not yet sure of his ground. The reader will do well to study the quotations, but he had better leave the author's conflicting theories and the formulæ on p. 326 severely alone.

On the details of sanitary plumbing the author is almost as contradictory as he is on sewer ventilation. With reference to cast iron soil-pipes, it is said on p. 302 that they "should be at least 4 in. in diameter to obviate the risk of becoming choked," while on p. 304, in the paragraph entitled "Soil-pipes, Size of —," we read that "a 3-in. pipe is sufficient for this purpose [*i.e.*, for keeping them "clean and wholesome"] even where several water-closets discharge into it (fig. 176)." The figure shows six closets served by one soil-pipe. Waste-pipes are inadequately treated; on p. 307 we have the illuminating paragraph: "*Waste-pipes.* — Waste-pipes from small sinks and baths are often made of light lead piping, six pounds per foot run." The ventilation of waste-pipes is dismissed in twelve lines, commencing on p. 335. In one of the chapters on apparatus, we are told (p. 437) that "a trap of the class shown in fig. 250 or 251, p. 363, should be fixed immediately below the sink"; one of these is a Mason's trap, and the other the old pattern D-trap. This is clearly a slip in reference, and quite pardonable in the case of a large work like this. On p. 439 it is said that a pantry sink ought to be fitted with a trap "selected from those illustrated in fig. 312 or 313, p. 382." One of these is a w.c. trap with a 4½ in. inlet. Pantry sinks, we are told on page 438, "should not be less than 15 or 16 in. deep." Modern wastes and overflows for sinks are conspicuous by their absence.

The sections on baths and lavatories are almost equally inadequate and unsatisfactory. Copper baths, it is said, "are the most durable and retain heat better." This is very loosely expressed. On the next page (441) the author states that "all bath-wastes should discharge .... into an open channel leading to a self-cleansing drain-trap, such as are represented in figs. 289-293, pp. 374, 375." Of the two traps thus recommended, one is a deep silt-trap with perforated bucket, and is therefore not even intended to be self-cleansing. The size of lavatory wastes is dismissed in two lines, which are almost as enigmatical as sybilline leaves—"the waste-pipe from a lavatory basin should be large enough to admit of rapid discharge, and it is usually from 1 in. to 1¼ in. in diameter." We are also told (p. 446) that a certain lavatory basin, the waste-pipe of which is (according to the drawing) not more than 1¼ in. in diameter, "forms an efficient drain flusher." Perhaps Colonel Moore can explain how it comes to pass that a 4-in. drain is efficiently flushed by the discharge of 2 or 3 gallons of water through a 1¼-in. pipe, and how he reconciles this statement with the table on p. 449, where we are told that it is "generally considered necessary" to provide a chamber holding 30 or 40 gallons for the efficient flushing of a 4-in. drain. This table, by the way, is of very little use, as the length of the drain is not taken into consideration. No practical man would dream of fixing flushing chambers of the capacities stated in the table in connexion with short drains. In giving Mr. Adams's method of calculating the volume of water required for flushing sewers (p. 453), Colonel Moore includes the *length* of the sewer as one of the factors to be considered, although, with as little regard for grammar as the monks of Rheims, he says, "there is little actual data bearing upon sewer flushing available."

House drainage is, on the whole, more satisfactorily treated, but even here there are several inconsistencies and lapses from perfection. We read (p. 309) "drains should never be laid under buildings," and then we are told that where such drains are absolutely necessary they should be of cast iron. "Never" is a word not easily qualified; it would be better to use the Gilbertian phrase, "well, hardly ever." The author proceeds to say that cast-iron drain-pipes should be "coated inside and outside with Dr. Angus Smith's composition," forgetting that he has previously stated that the glass enamel now applied to iron pipes "is impervious to the action of sewer-gas, and renders the pipe as smooth as if it were made of glass." The connexion of the soil-pipe with the drain in plate xix. is made within the thickness of the wall, although there is an inspection-chamber outside the building within 2 ft. of the pipe; the correct method would be to carry the soil-pipe into this chamber. In plate xvii. two 4-in. "foul-air extracting shafts" of equal height are carried up from drains leading to one inspection-chamber; a plan ought to have been given showing the position of the two shafts in relation to the chamber. Two more quotations, and we have done with this part of the subject, although we have not by any means exhausted our black list:—"It is sometimes necessary, when the natural action is insufficient to induce an upward current of air in the ventilating-pipe, to employ a cowl." This is from p. 331. On p. 325 we read "inlets and outlets must therefore be considered as possibly acting alternately in any capacity." In other words, the natural action in every ventilating-pipe must be considered as sometimes insufficient to induce an upward current. Must every ventilating-pipe, therefore, be provided with a cowl? Fig. 210 and plates xvii. and xix. answer no. What, then, must be done? Shall we be wrong in concluding that every ventilating-pipe must be fitted with an anemometer, and day-and-night watchmen set to observe it, with definite instructions that, when "the natural action is insufficient to induce an upward current of air," the watchman on duty shall climb to the top of the pipe and place a cowl on it?

Probably it will be of service to Colonel Moore if we point out a few of the minor errors which we have discovered in the new edition. In the first edition (p. 24) and in the second edition (p. 33), we read that "in 1873 M. Liernur introduced his somewhat complicated vacuum system for the transmission and collection of sewage." In the new edition this system is described on pages 43-5, and we are told that "Liernur's Improved Pneumatic System" was introduced in 1868, and first employed at Amsterdam in 1871. The reference on p. 215 should be to p. 56, not 47. It

is a mistake to say (p. 239) that to make drain-pipes 3 ft. long "is only practicable for the larger diameters"; even 4-in. pipes are now made 3 ft. long "*ex* socket." Whether stoneware pipes more than 18 in. in diameter may be used for sewers, depends upon the strength of the pipes and other circumstances; such pipes have been satisfactorily used up to 3 ft. in diameter. We have already drawn attention to Colonel Moore's method of writing on water-closets, and need only quote his statement (copied from the first edition) that "wash-out closets. . . . are in great demand" to show that the revision is not by any means as thorough as it ought to have been.

Let us now turn to sewage disposal. In the first edition there was one chapter on this subject, occupying 107 pages. In the new edition two chapters, with an aggregate of 163 pages, are devoted to it, namely, chaps. xiv. and xv., the latter dealing entirely with bacteriolysis. This chapter contains 105 pages, or, strictly speaking, 104¼—very nearly twice as many as the subject occupied in the first edition. If from these 104¼ pages we deduct the six pages of illustrations (none of them original), we have a residue of 98¼ pages of text, of which about 83¼ are admitted to be either quotations from existing works or written by persons other than Colonel Moore. The remaining fifteen pages are almost entirely occupied by condensed accounts of experiments and apparatus; the first page only appears to contain strictly original matter by the author of the book, and this is a summary of the defects of treating sewage on land and by chemicals. The first quotation consists of a paper read by Sir Douglas Galton before the Sanitary Institute in December, 1895, together with the discussion thereon, and extends from p. 574 to p. 593. Thirteen pages are occupied by Colonel Waring's description of bacteriolysis and his apparatus, and tests in connexion therewith. We need not particularise the remaining quotations. Some of them are written by patentees or other persons interested in the processes and apparatus described. We merely state this as a fact, without any reflection on the value of their contributions. But, we ask, how are we to review or criticise a chapter like this? The so-called author of the book is scarcely in evidence from the beginning of the chapter to the end. All we can do is to criticise his method of book-making. Surely it was within his powers to have written a succinct account of the processes involved, and then to have gone on to describe the different kinds of apparatus, instead of letting different writers repeat *ad nauseam* the very elements of the subject. The chapter might thus have been reduced nearly one-half, and would have formed a consistent whole, instead of being, as it now is, a heterogeneous collection of extracts from trade circulars and the author's commonplace book.

We regretfully come to the conclusion, therefore, that the second edition of this large book has not gained in value as much as it has gained in bulk. Like the first edition, it contains a vast amount of extremely useful information, but there is too much book-making about it and too little authorship. We do not wish to leave a wrong impression, and it is with pleasure that we draw attention to the voluminous labour-saving tables, which are such an important feature of the work; to the numerous illustrations and descriptions of sanitary apparatus, from household fittings and drains to sewers, sewage-disposal works, and refuse-destructors; and to the convenient collection, within one volume, of the opinions of so many sanitarians, distinguished and otherwise.

NOTES.

The New Government Offices.

IN Tuesday's *Times* Mr. Leonard Stokes, who is one of the late Mr. Brydon's executors, returned to the charge in regard to the proposed carrying out of the Government Offices by the Office of Works, in an admirable and forcible letter, in which he replied to the absurd statements made in the communication to the *Times* "From a Correspondent," to which reference has already been made in our columns. We are glad to be able to add that his letter was enforced by another excellent and sensible leading article in the *Times* of the same date, putting the case as well and as strongly as it could possibly be put. As the writer says, if Sir John Taylor is an eminent architect competent to carry out a great piece of architecture of this kind, why was he not originally named and included among the list of architects whose names were first suggested for the work? The Government never proposed him then; they wrote to the Institute of Architects to recommend a list of names for the War and Government Offices. We have no desire to say a word against Sir John Taylor, who as a Government official (and a very able one in a practical sense) is bound to carry out the orders of his official chief. The *Times* goes on to remark that if we desired to have an Office of Works to design great buildings we should of course put at its head and into the ranks of its officials the most eminent architectural talent of the day:—

"To such a department we might perhaps safely entrust the expression of the national taste in architecture. To the Office of Works, as at present constituted, we can entrust nothing of the kind. Its whole conception of a public building appears to be that of a builder, not of an architect. It is not even actuated, we are assured, by a zeal, laudable in itself though deplorable in the particular application, for public economy. It proposes to take a course not less costly than that which commends itself universally to professional and enlightened opinion, and to take it, so far as we can see, out of sheer lack of artistic perception. For this is really all that the argument of its apologist comes to. If you can only get a distinguished architect to make a pretty drawing and leave a few unfinished sketches, all the rest can be done by a draughtsman, a couple of departmental officials, and a competent builder. We can only say that no great public building ever was, or ever can be, produced in this way."

It is encouraging to find such a line as this taken by the leading journal. For many years the *Times* seemed to be under a kind of hereditary disposition to scout architecture and architects, and little was admitted into its columns on such subjects beyond the Philistine amenities of Lord Grimthorpe. We may congratulate our great contemporary on having at last taken up a line in regard to public architecture which will earn for it the gratitude and sympathy of all artists.

Sir John Gorst on Education.

IT would have been more satisfactory if Sir John Gorst, as President of the Educational Section of the British Association, had last week in his address endeavoured to give some scientific and statistical view of English education rather than deliver a mere desultory essay. No one perceives more keenly than the Vice-President of the Council the weak places in our system of national education, and no one seems to take more pleasure in pointing them out, at the same time abstaining from giving us remedies. Perhaps the most important point of the address was the clear manner in which Sir John Gorst stated what cannot be too often repeated, that it is useless to hope for good results from technical and secondary schools until elementary education is thoroughly sound. "Classes and schools spring up like mushrooms, which profess to give instruction in the lacking branch of applied science to scholars who have no elementary knowledge of the particular science, and whose general capacities have never been sufficiently developed. Science cannot be taught to those who cannot read, nor commerce to those who cannot write." These and more like them were the statements of the Minister of Education. Practical men would say that if such is the opinion of this official he should enthusiastically and strenuously labour to improve the elementary education of England. But, unfortunately, Sir John Gorst regards it rather from the point of view of the philosopher than of the administrator.

Subways for Underground Pipes.

PLAINTIVE suggestions are made from time to time that the system of subways inaugurated in the City some years ago should be extended to all parts of the metropolis, but no one expects any practical result from such appeals. The number of companies privileged to interrupt traffic by tearing up streets is steadily on the increase, and corporations of this kind seem to grow more fastidious year by year. At one time any old roadway served to gratify their destructive instincts, but in the present day nothing less than a newly-laid pavement will suffice. It is perhaps not to be expected that the welfare of the community should influence the operations of a public company, although consideration for the pockets of shareholders might be looked for. If gas, water, electric and other mains could be laid, altered, or repaired during the renovation of a road surface, some saving would certainly be effected. The fascination exercised by the pastime of road-wrecking must be as powerful as it is mysterious, otherwise pecuniary advantage would never be relinquished for the empty pleasure of spoiling smoothly-paved streets by digging out and filling in trenches, the traces of which frequently remain more or less permanently in the form of irregularities and projections above the normal surface level. Much as the public may desire to see the establishment of subways, nothing can be done without legislation, for the streets have been given up by Parliament to numerous companies who are duly authorised to break them up and to play havoc with traffic at will. A similar problem now confronts the municipal authorities of New York City, where various conduits are buried in any sort of fashion beneath the streets. Referring to this important question, the *Scientific American* says: "It is a pitiful commentary upon our supposed twentieth century development that these mains should be buried beneath the streets

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in altogether haphazard fashion." The rapid transit tunnel would have included provision for water, gas, and other mains in roomy galleries had not opposition been offered by the sewer, gas, and water departments, who raised objections that are characterised by our contemporary as being of a trifling nature. At present, therefore, the pipes are merely suspended from falsework during the construction of the tunnel, and after a section is completed, the soil is filled in around the pipes, leaving them in the usual undesirable state, which requires disturbance of the roadway whenever repairs or other attention is needed. So we find the *vis inertiæ* of vested interests is already a factor to be reckoned with even in New York, where people affect surprise at the slow growth of municipal reforms in London. The fact is that in all great cities there is urgent need for a constantly progressive policy, and this will only be seriously considered when the authorities find the public to be emphatic as to the necessity for its adoption.

The New Redheugh Bridge, Newcastle-on-Tyne.

THE old Redheugh Bridge between Newcastle and Gateshead, erected in 1871, has recently been replaced by a new structure built from the designs of Messrs. Sandeman & Moncrieff, MM.Inst.,C.E., of Newcastle, and the work involved a most interesting and probably unprecedented engineering feat, deserving more than passing notice. The old bridge was of the suspension type, having masonry approaches, one at Newcastle 216 ft. long, and the other at Gateshead, 132 ft. long. There were three river piers and four spans, two of 168 ft. and two of 252 ft., the total length of the bridge and approaches being 1,187 ft. For various reasons it was found necessary to build the new bridge on the old site, and this task was successfully accomplished without stopping foot traffic for a single day, and without interrupting vehicular traffic until the work was nearly completed. The foundations of the new river piers each included four cylinders, two being disposed on either side of each old foundation; the river piers were built up outside the old piers and braced together as far as possible. During the conduct of this work, the approach arches at each end were centred and taken down simultaneously, the roadways having been previously shored up. The masonry of the piers and abutments was then built up as to half the width to the required level, and half the width of the new girders, superstructure, and roadway were finished, the other half being afterwards dealt with in a similar manner. Then the main girders of the river spans were built out as cantilevers from the new pier heads, the projecting ends of the two longer girders were joined at the centres of the spans, and the two shorter girders were built out entirely as cantilevers, reaching from the outer river piers to the masonry approach piers. But the girders were not erected in their final position, as the centre line of each was 4 ft. 6 in. away from the centre line of the river piers, and they were slightly higher than the proper level. This mode of procedure was rendered possible by the large cross girders joining the pairs of columns forming the river piers. When the four spans had been practically finished, the entire structure of the old bridge was taken down, all hitherto uncompleted bracing was put in, and the main girders—weighing about 1,600 tons—were moved over horizontally by means of hydraulic jacks. This operation was commenced early on the morning of May 6 last, and so carefully had all the details been thought out that the work of shifting the girders only occupied a few hours. The spans were then adjusted to a uniform gradient and line, and the fixed and roller bearings were inserted. Afterwards the flooring, roadway, and footpaths were finished, and the new gas and water mains, which had been temporarily uncoupled, were joined up. The new Redheugh bridge is of unpretentious design, but it has the merit of looking exactly what it is—a steel-girder bridge; and further, the skilful manner in which all the details of construction have been designed and executed reflect the greatest possible credit upon the engineers and upon Sir W. Arrol & Co, the contractors.

A New Departure in Gas Manufacture.

THE Gas Section of the International Engineering Congress held last week at Glasgow was presided over by Mr. George Livesey. In his address Mr. Livesey pointed out that "consumers now have it in their power to get out of 5 cubic feet of gas per hour anything from five to 150 candles from ordinary coal-gas, whether it be nominally ten, fifteen, or twenty so-called candle-power," and exclaimed, "What a useless absurdity does this make of all illuminating power tests!" We quite agree that, owing to the introduction of the incandescent gas light and the extensive use of gas for heating, the so-called illuminating power has become a matter of secondary importance as compared with heating power; but until Parliament has fixed a standard calorific value to take the place of the present illuminating power standard we think it would be inimical to the interests of gas consumers to allow the illuminating power tests to be abandoned. Professor Vivian B. Lewes read a paper on "The Utilisation of Water-Gas in the Destructive Distillation of Coal," in which he described a new method of gas manufacture by which low-grade gas of high calorific value can be made more cheaply than has hitherto been possible. The coal is heated in retorts in the usual manner; but while carbonisation is being carried on a rapid stream of non-luminous water-gas is passed through the retorts in order to push the coal-gas out of the zone of heat before its richest illuminating hydro-carbons have been decomposed into products of less value. By adding 40 per cent. of water-gas (costing $3\frac{1}{2}$d. per 1,000 cubic feet) in this manner, a mixture is obtained which has a heating value about 15 per cent. lower than ordinary coal-gas of good quality, and an illuminating power about one and a half candles lower. The ordinary consumer would probably not detect any difference between this mixture and ordinary coal-gas. In view of the excessive cost of the gas supplied by the Gas Light and Coke Company on the north side of the Thames, it is to be hoped that this company will lose no time in obtaining Parliamentary sanction for a reduction of the standard illuminating power, and by adopting this new process make a substantial reduction in the price charged to consumers. The economy effected by the new process has been found by working on a fairly large scale to be 2s. 1d. per ton of coal carbonised, and as the quantity of coal used by the London gas companies amounts to four million tons per annum, the economy effected in London alone would exceed 400,000*l.* a year.

Superheated Steam in Radiators.

IN a paper read before the American Society of Heating and Ventilating Engineers, Professor R. C. Carpenter directs attention to a curious effect due to the accidental presence of superheated steam in some radiators tested by him in the spring of 1901. The radiators were placed on a platform about 2 ft. above the floor, so that vessels might be employed for receiving the water of condensation. Steam was furnished from a high-pressure main, having passed through a separator to remove free water, and thence through a reducing valve for the regulation of pressure. Temperatures were taken of the outside air and at several places in the compartment where the tests were conducted, the temperatures of steam condensed and of the radiator surfaces being also recorded and the water of condensation was carefully weighed after being cooled. It appears that the process of reducing the pressure caused wire-drawing of the steam, thus liberating a considerable amount of energy which was expended in superheating the steam, and, contrary to expectation, the result was clearly to reduce the quantity of heat transmitted by the radiators. Expressing heat transmission in British thermal units per hour, per square foot of surface, per degree difference of temperature, the following effects were ascertained: With one radiator using saturated steam at 2 lbs. pressure, the heat transmission was 1·48; when using steam at the same pressure, but with 36 deg. superheat, the transmission only reached 1·16. With the other radiator a corresponding loss of efficiency, from 1·83 to 1·41, took place. Similar experiments were made with steam at 5 lbs. and 10 lbs. pressure with varying degrees of superheat, and in every instance decrease of heat transmission followed the increase of superheat. It is, therefore, manifest that superheated steam is a very undesirable medium for warming purposes, probably for the reason that in this state the vapour of water has the properties of a perfect gas, and parts with its heat less rapidly than when it is in the ordinary or saturated condition.

Buckinghamshire Roads.

THE annual Report of the County Surveyor, Mr. R. J. Thomas, on the highways of the county of Bucks is of more than local importance. Mr. Thomas has a high reputation as a road administrator, and the Report which he issues enables an opinion to be formed of the progress of English highways. For the county of Bucks is of a varied character, and highways of every kind are to be found in it. From the chart showing the cost per mile of the Bucks main roads for the twelve months ending March in each year since 1886, we obtain a clear idea of the results of recent legislation. In 1887, 1888, and 1889 the roads were under parish management, and the cost for each of these years was 65*l.*, 67*l.*, and 62*l.* respectively. In 1891, the second year of the administration by the County Council, the cost had fallen to 53*l.* Then came a period of exceptional expenditure on

materials, so that in 1893 the cost was 75*l.* per mile. It then fell rapidly, so that in 1896 it was only 52*l.*, and has since kept almost this level, though in 1901 it rose to 53*l.* It is thus clear that an exceptional expenditure on highways, so as to place them in a thoroughly sound condition, is far more economical in the long run than a niggardly policy; and it is also clear that the main roads of Buckinghamshire are now kept in a better condition and at a less cost than under the less intelligent and amateur management of parish surveyors. The practical moral to be deduced from this Report is that the County Council should be the sole highway authority for every county.

Restoration Work at Oxford.

RESTORATION work of some importance in now in progress at Oxford, both at Christchurch and at Merton. At the latter the front of the north transept of the chapel is undergoing repair, being as far as can be ascertained, refaced. At Christchurch two pinnacles are being added to the east end of the cathedral, at present wooden patterns being erected at which, of course, plenty of adverse criticism is directed. The east side of the well-known Tom bell-tower is also being restored. The work at Christchurch is under the advice of Mr. Bodley, and at the cost of two members of the college. It is satisfactory to note this generosity, for of late the pious benefactor has not been much in evidence at the Universities, and his assistance is needed as much now as in former days. Of course there are some who would prefer that ancient buildings should remain untouched, but in regard to many the time must inevitably arrive when work must be done upon them if they are to be preserved for future generations. Nothing is, indeed, more striking at Oxford to-day than the decayed state of much of the stonework, many of the details of the sculptures and carving being quite obliterated by time.

Dryden's House in Soho.

WE notice that house-breakers are at work upon the demolition of No. 43, Gerrard-street, Soho, which it seems had fallen into decay. The only part standing when we last saw it was the basement, and above it "the ground-room, next the street," in which, as Pope records, Dryden "used most commonly to write." The house is that to which Dryden removed from Long Acre in 1686, and where he wrote "The Hind and the Panther," his first Ode for St. Cecilia's Day, "Alexander's Feast," the version of Virgil; the "Fables," and several dramas including "King Arthur" and "Don Sebastian." At that time the back windows of the house gave a view of the gardens of Leicester House. Dryden died at No. 43, Gerrard-street, on May 1, 1700. A collection of extracts made some years ago from the rate-books of St. Anne, Soho, shows that Dryden when living there was rated at the sum of 11*s.* 3*d.*, and that his widow, Lady Elizabeth Dryden (whose name, by the way, is entered as "Madam Dryden") continued to occupy the house, being rated at 12*s.* The street had been built in or about 1680 upon some land which had formed the military exercise and artillery ground of Henry, Prince of Wales, and afterwards became the property of Charles Gerard, Earl of Macclesfield. The street was a fashionable quarter at one time. In a period of thirty years reckoned from 1691 were rated (with other notable persons) the Earl of Manchester (1693), "Earle Maxfielde" and Lord Wharton (1700), Lord Mohun (1706), General Holmes and Colonel Brett (1711), Lord Howe, the Countess of Suffolk, the Duke of Norfolk, Lord Kerr, and the Earl of Scarbrough (1711); and Lady Maynard (1721). Lord Macclesfield's house, on the south side, was consumed by fire on August 10, 1887.

The Photographic Salon.

THE ninth exhibition of the Photographic Salon, which professes to illustrate photography as a fine art, is open at the Dudley Gallery. The means by which this is done in many cases seems to be either to make a faulty photograph, out of focus and blurred, or to work up the photograph until it ceases to be properly speaking a photograph, and becomes something else. Thus Mr. Moss's "Tidal River" and Mr. Bourgeois' "The Clyde, Glasgow" appear to be worked on afterwards; the lights on the water in the latter have all the appearance of being put on by hand. Mr. Hinton's "Recessional" has the appearance of a mezzotint; what process it has gone through we do not understand, but a pure photograph in the ordinary sense it is not. Dr. Henneberg's "Fishing Boat" and others seem to have been made up in a somewhat similar manner; Mr. Davison's "Lucerne" is apparently out of focus and all misty and uncertain. Then we have photographs that look as if they were made on canvas, and others that seem to be made on blotting-paper. But these contrivances to make a photograph look like brush-work only serve to remind one how much better and more interesting brush-work is. Some photographs of sprays of flowers would be very useful as studies for artists; in themseves they have not the value of a drawing; the only one which has some claim to be a work of art is perhaps Mrs. Cadby's "Snowdrops," on account of the care which has been taken in combining the delicate white flowers with the delicate greyish background. Mr. Keighley's "The White Sail," in which a drooping sail of a boat aground is backed by the curved wall of the pier, is a good piece of composition; and in composition there is something to be done in photography; the photographer may choose a better or worse point of view, or he may group or pose a figure well or ill. In this respect, however, the natural man is more recusant in real life than he is in the hands of the painter, and it is rarely that we find a photographic group or figure as well posed as a painter will do it, who can to some extent create the pose he wants. And on the whole we prefer good photographs which are simply photographs to those which try to be something else. There is Mr. Craig Annan's really fine portrait of Professor Young, for instance, and Mr. Hollyer's of Captain Hutton; most satisfactory examples of photographic portraiture. An open air study by D. Spitzer, of a powerful naked man carrying a stone up a hill (we wonder it is not called "Sisyphus"), is a good piece of work. As we have before complained, architecture, the class of subject best of all suited to photography, is nearly ignored. Mr. H. H. Hopkins, however, shows a clear little photograph of "Varenna," Mr. F. H. Evans a little miniature interior of Bourges, "Height and Light," which is very successful; and Mr. H. W. Bennett an interior, "In an Old Church," which we take to be St. Albans.

NOTES ON THE BRITISH ASSOCIATION MEETING.

PROFESSOR RÜCKER'S inaugural address, more concentrated as to subject and more popularly comprehensible than some Presidential addresses on these occasions, afforded an admirable summary of what may be called the greatest step in recent times towards a true conception of the mechanism of matter—that matter which is the constituent of the universe and the substratum of life. Most of what he said as to the atomic theory of matter, or what he called in one passage of the address the "coarse-grained character of matter,"* should by this time be familiar to all who, even without claiming to be physical scientists themselves, have kept an intelligent eye on the progress of scientific conception and reasoning. For it is by reasoning rather than observation that the atomic theory has been established, as it may now be said to be; at all events, as Dr. Rücker put it, "the atomic theory must hold the field until another can be found which is not inferior as an explanation of the fundamental difficulties as to the constitution of matter." For that is the only test we can have of the truth of a theory which deals with conjectured atoms invisible to sight: does it offer the best-known explanation of the phenomena that are visible? In this light, the atomic theory seems justified at every turn. It meets us as the rational explanation of the interpenetration of gases and fluids, by an analysis of the same order as that which has apparently solved the question of the mechanical stability—even possibility—of Saturn's rings. No telescope has brought us near enough to Saturn's rings, or probably ever will, to enable us to form any judgment from the appearance of their surface as to their constitution; but analysis has shown that their constitution and stability are explicable on the theory that they are composed of small particles with independent motion; and, so far, on no other theory. These are not "atoms," of course; they may be comparatively large particles; but the process of reasoning applied to them is the same; it is the atomic theory on a magnified scale. Late as this discovery is, comparatively speaking, it may already pass as a scientific commonplace. One or two illustrations not so familiar were cited in the course of the address. The most striking of these is the experiment of Sir W. Roberts-Austen, who placed pieces of gold and lead in contact at a temperature of 18 deg. C. "After four years the gold had travelled into the lead to such an extent that not only were the two metals united, but, on analysis, appreciable quantities of the gold were detected even at a distance of more than 5 millimètres from the common surface. . . . Whether it is or is not possible to devise any other intelligible account of the cause of such phenomena, it is certain that a simple and adequate explanation is found in the hypothesis that matter consists of discrete parts in a state of motion, which can penetrate into the spaces between the corresponding parts of surrounding bodies." A very little thought will show that any theory which regards the lead and the gold as close and compact substances entirely united is absolutely at variance with this ascertained fact of interpenetration. The deductions from one such observed fact are wide-reaching, and must affect our whole conception as to matter. Where we are brought up is when we attempt to step from the conception of inanimate matter to that of life. "Perhaps," observed the President, "the chief objection which can be brought against physical theories is that they deal only with the inanimate side of Nature, and largely ignore the phenomena of life." But is not the step here referred to the eternally impassable one—the "Thus far shalt thou go and no farther" addressed to the human intellect. As to the mechanics of

* Those who were present at the remarkable Friday evening lecture given at the Royal Institution a good many years ago by Lord Kelvin (then Sir W. Thompson), may remember his illustration of the atomic structure and movement in matter by means of a number of ivory balls hung on a level and at equal distances by long threads from the ceiling, and which all entered into movement from an impulse given to one of them.

matter we may look to continually increase our range of observation and knowledge, but the mystery of *life* will still remain the Sphinx whose riddle none may hope to read.

Considerations as to the constitution and mechanics of matter will hardly, it is true, affect architects practically in dealing with construction; but they serve to give us a clearer idea of the nature of the material universe which is our basis of life, and therefore they should be of interest to all thinking persons, of whatsoever profession. In our notes on the remainder of the proceedings, we must confine ourselves to the papers on subjects of more direct interest to our readers. In the Geographical Section the President of the section, Dr. H. R. Mill, took for his subject "Research in Geographical Science," in the course of which he thus defined the principles of geography * :—

"The science of geography was, of course, based on the mathematical properties of a rotating sphere; but if they defined geography as the exact and organised knowledge of the distribution of phenomena on the surface of the earth, they saw the force of Kant's classification, which subordinated mathematical to physical geography. The vertical relief of the earth's crust showed them the grand and fundamental contrast between the oceanic hollow and the continental ridges; and the hydrosphere was so guided by gravitation as to fill the hollow and rise upon the slopes of the ridges to a height depending on its volume, thus introducing the great superficial separation into land and sea. The movements of the water of the ocean were guided in every particular by the relief of the sea-bed and the configuration of the coast lines. Even the distribution of the atmosphere over the earth's surface was affected by the relief of the crust, the direction and force of the winds being largely dominated by the form of the land over which they blew. The different physical constitution of land, water, and air, especially the great difference between the specific heat and conductivity or diathermancy of the three, caused changes in the distribution of the sun's heat, and as a result the simple climatic zones and rhythmic seasons of the mathematical sphere were distorted out of all their primitive simplicity. The whole irregular distribution of rainfall and aridity, of permanent, seasonal, and variable winds, of sea climate and land climate, was the resultant of the guiding action of land forms on the air and water currents, disturbed in that way from their primitive theoretical circulation. So far, they saw that the surface forms of the earth, themselves largely the result of the action of climatic forces, and constantly undergoing change in a definite direction, controlled the two great systems of fluid circulation. Those in turn controlled the distribution of plants and animals, in conjunction with the direct action of surface relief, the natural regions and climatic belts dictating the distribution of living creatures. A more complicated state of things was found when the combined physical and biological environment was studied in its incidence on the distribution of the human race, the areas of human settlement, and the lines of human communications. The complication arose partly from the fact that each of the successive earlier environments acted both independently and collectively; but the difficulty was in greater degree due to the circumstance that man alone amongst animals was capable of reacting on his environment and deliberately modifying the conditions which controlled him. It seemed to him that the glory of geography as a science, the fascination of geography as a study, and the value of geography in practical affairs were all due to the recognition of that unifying influence of surface relief in controlling, though in the higher developments rather by suggestion than dictation, the incidence of every mobile distribution on the earth's surface."

Following out this idea, geographical study might be classified into geomorphology, dealing with the forms of the solid crust of the earth; oceanography, dealing with the masses of water on the globe; and climatology, dealing with the effects of solar energy in the air. Considering the subject of geography and the State, he believed that geography would be found to afford an important clue to the solution of every problem affecting the mutual relations of land and people, enlightening the course of history, anticipating the trend of political movements, and indicating the direction of sound industrial and commercial development. Unfortunately, it would be easy to enumerate misconceptions of history, blunders in boundary settlements, errors in foreign policy, useless and wasteful wars, mistakes in legislation, failures in commercial enterprise, and lost opportunities in every sphere, which were due to the neglect of such a theoretical geography. Surely it was to the laws defining the interaction of nature and man that they should turn for guidance in such affairs, rather than to the dull old British doctrine of "muddling through."

In connexion with this subject Dr. Mill complained of the serious omission in the Ordnance Survey, that the extension of the survey to the lake-beds should have been forbidden on the score of expense, and spoke with satisfaction of the prospect of this totally indefensible omission being made up for by a survey of the lake-beds which was proposed to be carried out as a private enterprise by Sir John Murray and Mr. Laurence Pullar. At the conclusion of his address Dr. Mill warned his hearers that this country was not in a satisfactory state in regard to geographical work. The best work of some of our cartographers in Edinburgh and London need fear no comparison; but in the main it could not be denied that Germany led the world in map-making. It would be interesting to know how many pennies in the income-tax would have been saved had we been possessed, in the present war, of fuller and better maps of the country, resulting from a survey of South Africa carried out as an Imperial duty when Cape Colony was settled. The survey would not have prevented the war, but it would have shortened it by some months. Meteorological surveys would also become of increasing national importance in view of the probability that wind and water would be more used in future in industrial enterprises, and the Government ought to place our great national industries, in this respect, on a basis of scientific knowledge.

At a further meeting of the section Mr. Chisholm read a paper on "Geographical Conditions Affecting British Trade," in the course of which he alluded to the great advantages which those countries would have, in the near future, which possessed the greatest natural opportunities for the development and use of water power; Switzerland, Norway, Italy, Canada, and the United States being in this respect all more advantageously circumstanced than Great Britain. Italy, in particular, which since the opening of the Suez Canal held a very favourable commercial situation, was developing the resources of water power largely, and might thus be able to develop a great trade based on her own resources. In answer to a question as to the effect on England of a successful completion of the Panama Canal, Mr. Chisholm thought it would tend more to the advantage of the eastern seaboard of the United States than of this country, but he would not say that Great Britain would not benefit at all by the carrying out of such a work. At a further meeting of the Section Professor Smith read an interesting paper on the botanical survey of Scotland. The 1-in. maps of the Ordnance Survey had been used for the full work, the 6-in. maps for smaller areas. One object was to mark the different associations of plants, and the dominant species, in each area. On the sea-level was the maritime or littoral association. Then came the cultivated land, which was rather difficult to deal with, being too much under the influence of man. It was divided into two classes, a better class on which wheat was grown, and the poorer class where wheat did not enter into the rotation. The vegetation on the arable land was marked, and the woodlands were also recorded—oak, pine, and on Scotch maps larch. The heather moorlands were recorded by a different colour, and the grasses again by another. Above the 2,000-ft. line the heather gave out, and the blaeberry association became dominant. Above the 3,000-ft. line was the Alpine plateau, on which it was difficult to say what was the dominant species.

In the course of the discussion, the President pointed out that by the study of plants which resisted erosion and the movement of sand dunes the Emperor Napoleon hit upon the idea of binding together a part of the coast of France with the result that had had enormous practical value. Some years ago, too, a British General, when visiting a newly-erected fortress on the coast, asked the officer in command why the mound was so bare. He was told that grass had been tried upon it but would not grow. He replied, "Sow no more grass, but go along the coast and find out what plants are growing there naturally. Get them and plant them." This certainly suggests a very practical application of the knowledge of geographical distribution of vegetation.

On the subject of the Lakes of the British Isles a special conference was held at a later period of the meeting, a joint conference of the Geological, Zoological, and Geographical sections, at the close of which a resolution was passed expressing the gratification of the conference that the work of this amateur survey would be carried on under the direction of Sir John Murray, and also their sense of the munificence of Mr. Pullar, who it is understood is providing the funds for the work.

The address of Colonel Crompton, President of the Mechanical Science Section, was occupied with three main subjects—high-speed railways, traffic in streets, and foreign competition. He considered that in future high-speed railways would be worked by electrical power, and that there would be a great development of such railways over the long distances presented by American travel. In England there were only a few journeys long enough to make saving of time by high speed a very essential element, and the topographical question would put English engineers at a disadvantage, since the number and mileage of such railways would be far greater on the Continent and in America than in England. We do not see the force of the argument; if high-speed railways can be made safe and are not injurious to health (on both which points we have our doubts), people in England will alike demand them in spite of the comparatively short distances. But the question arose, he said, whether rapid transit between two towns might not best be effected by high-speed motor cars running on special roads constructed for the purpose. This is an idea worth consideration, but it is to be hoped separate roads would be provided for going and returning, otherwise, in spite of steering, there would be likely to be some fearful accidents. In regard to street traffic Colonel Crompton laid stress on the difficulties created by the mingling of slow and quick (or what should be quick) traffic, and by the constant neglect of the rule to keep to the left of the roadway except when moving out to pass another vehicle. This is very well on paper, but there is little possibility of adhering to such a rule in crowded streets. "A great deal might be done," he suggested, "by arranging that during certain hours much of the slower moving traffic should be shunted into alternative routes, so as to be kept by itself. Motor cars could safely travel at sixteen miles an hour, and therefore need only take half the time and occupy only half the street surface that an omnibus did when travelling at eight miles per hour. Such high speeds as these, which were desirable and perfectly safe for motor cars, could not, however, be obtained unless some regulations were made as to the use of the roadways by foot passengers;" and it was also suggested that towns situated on our main through roads should provide alternative routes so that through travellers could, if they desired, avoid the crowded streets of the town. But how many through travellers are there in the streets of our large towns? Vehicles coming to a large town have almost invariably that town as their immediate object; the through traffic would not be important enough to justify a special route. On the whole, one can hardly consider the address a very logical one, or adding much to the subject. In regard to foreign competition, Colonel Crompton emphasised the fact, which has been more than once referred to in our columns, that "the chief difference between the manufacturer of America and the manufacturer at home was that, whether it be steam-engines, tools, agricultural machinery, or electrical machinery, the American invariably manufactured goods in large quantities to standard patterns. In America work was far more specialised than here, so that a manufacturer as a rule provided himself with a complete outfit of machinery to turn out large numbers of one article. In America it seemed to be understood by the purchaser that it was a distinct advantage to every one concerned, both manufacturer and purchaser, that the purchaser should to some extent give way and modify his requirements so as to conform with the standard patterns. On other matters it was quite possible for manufacturers here to combine, so as to obtain some standardisation of parts. Many years ago Sir Joseph Whitworth impressed on the world the importance in mechanical engineering of extreme accuracy, and of securing the accurate fit and interchangeability of parts by standard gauges. But in spite of his idea being so widely known and

* The direct quotations are from the *Times* report, except the paper on lightning conductors by Mr. Killingworth Hedges, which is from a report specially furnished to us.

taught, how seldom had it been acted upon to the extent that it should be!"

It is this practice of manufacturing standard and interchangeable parts that enabled an American firm, not long since, to supply a Government order which English firms declared themselves unable to cope with in the allotted time. Such a system is not, of course, so satisfactory to an engineer, who likes to design structural details after his own mind; but it is a very important factor in the race against time, which is becoming so pressing an element in modern work.

At a subsequent meeting of the Mechanical Science Section Mr. Hele-Shaw read a paper on "Resistance of Road Vehicles to Traction," a subject which he has made his own, and on which he has been carrying out a series of special experiments. Mr. Norman Macdonald, of Edinburgh, read an important paper on railway rolling stock. He summed up, on the question of locomotives, in favour of the compound as against the simple engine, and expressed his surprise (as he well might) at the fact that only one railway in England regularly used compound engines. We suspect the fact is that one great railway company will not, out of jealousy or a fear to appear to be learning from its rival, adopt a principle which has been started by the locomotive designer of another great railway. Instead of that, they endeavour to show that it is all a mistake, and that the supposed advantage of the compound engine is imaginary; a conclusion with which facts and statistics are at variance. Mr. Macdonald next emphasised the importance of the boiler, and even recommended moderate-sized driving wheels in order to get in a larger boiler; a question, we take it, between speed and "staying power" in the engine. We were behind other nations in our locomotive boiler pressures, which showed an average of 180 lbs. pressure with occasional excursions to 200 lbs.; while in the United States pressures of 210 lbs. to 215 lbs. were the ordinary ones, and the best engines ran to 225 lbs. and 230 lbs., and it was expected that before long 250 lbs. and even higher pressures would become common. He also pointed out that at the Paris Exhibition the British locomotives were almost the only ones which did not show some form of equalising or compensating levers for the purpose of automatically distributing shocks over the various springs and axles. Mr. Macdonald seemed to suggest that our system of carrying rails in chairs tended to multiply shocks, and therefore the more required such precaution against their effects. He does not appear however to have stated what system of rail-laying be recommended as free from the supposed defects of our own. At the same meeting Lord Rosse read a paper on the rather novel subject "An Arrester for Intercepting Leaves in the Intake of a Water Supply:"—

"The apparatus consisted of a cylinder of wire gauze, 4 ft. in diameter and 4 ft. 6 in. in height, set in an opening in a vertical diaphragm extending across the supply drain and revolving twice in a minute or so round a vertical axis. The current flowed through the gauze cylinder in a horizontal direction. The leaves carried down with the current adhered to the cylinder under pressure of the stream, and were carried round till they reached the diaphragm. The latter on one side was double, with an intervening space of some 10 in., which was connected with the tail-race. When the cylinder had made a sufficient part of a revolution for the current, relatively to the gauze, to be reversed, the leaves were detached and carried by a portion of the water towards the tail-race. Four or five per cent. of the supply was ample for conveying the leaves; probably much less would suffice. A very few leaves got past and on to the screen, but so few that they gave no trouble."

At the meeting of the same section on the 17th it was stated that it had been usual to devote the Monday to electrical engineering papers, but that on this occasion none were forthcoming; an exceedingly surprising announcement considering the exceptionally active position of electrical engineering at the present moment. As the nearest approach to an electrical subject, Mr. Killingworth Hedges read a paper on "The Protection of Buildings from Lightning," of which we are able to give the following *résumé*:—

"The last time this subject was brought before this Association was at the Bath meeting in 1888, when a joint discussion of Sections A and G was held; but there has been no official report as to the effect of lightning stroke upon buildings protected by conductors since the Lightning Rod Conference of 1882. Interest in the subject has been again revived, first, by the Electro-Technische Verein of Berlin, who have this year published a set of rules; and, secondly, by the establishment in this country of the Lightning Research Committee, organised jointly by the Royal Institute of British Architects and the Surveyors' Institution.

The author compares Continental and American practice, and gives an account of his rearrangement of the system used at St. Paul's Cathedral, where the conductors, erected as recently as 1872, were found to be totally inefficient, both as regards the conductivity of the joints and the resistance of the earth connexions. In the plan recommended, both for this installation and for the more recent one at Westminster Abbey, the number of ordinary conductors from air to earth has been greatly increased, and, besides these, horizontal cables are run on the ridges of the roofs and in other prominent positions so as to encircle the building, being interconnected to the vertical conductors wherever they cross one another. The horizontal cables are furnished at intervals with aigrettes, or spikes, which are invisible from the ground level, and are designed to give many points of discharge. At the same time they, in conjunction with the cables, would receive any side flash which might occur should any portion of the building receive a direct stroke of lightning.

The unreliability of soldered joints for conductors, whether of cable or tape, has led the author to design a special joint box, which can be applied for uniting any portion of the system together in such a manner as to give great mechanical strength as well as good electrical contact; at the same time any box can have points inserted so as to form an aigrette in any desired position.

Owing to the difficulty of sinking an earth plate of sufficient area, on account of old foundations, a special form of tubular earth has been designed which takes up little space and has the advantage that if a suitable moist ground is not obtainable the desired low electrical resistance is attained by leading a tube in connexion with the rain-water pipes, so that a portion of the rainfall is diverted to the tubular earth.

The author alludes to the immense amount of damage to property annually occurring which might be prevented if efficient conductors were installed. He mentions that instead of every church having its lightning conductor not ten per cent. are so provided; and in the case of other public buildings the percentage is not much larger, the reason in the case of the former class of buildings being that a vicar wishing to safeguard his church has usually to pay the cost out of his own pocket.

Architects, as a rule, treat the question of lightning conductors in a very brief manner, and in their specifications seldom say anything as to the way in which they are to be run, or the necessity for good joints and good earth connexions."

We may have space for some further notes next week on some of the subjects discussed in other sections.

HYDE ABBEY AND KING ALFRED'S MILLENARY.

THE Millenary of King Alfred is an all-absorbing topic of the week. The City of Winchester, already interesting to the eye, is proving itself interesting to the mind as well, and the Cathedral, the West Gate, the City Cross, and other architectural treasures of the place are, for once, out-vied by the humbler scanty remains of Hyde Abbey and the Tudor-arched gateway in King Alfred-place, just beyond the north walls.

Appropriately enough, on the first day of the four devoted to the local festivities in honour of the great king, the Mayor's guests went in worldly pilgrimage to the shrine of their saint, Hyde Abbey, the site of King Alfred's interment, where, a month or two ago, some portions of the foundations of the apse of the abbey church were unearthed.

This church was the one to which the monks removed in 1110 from New Minster, which was so close to the Cathedral, or Old Minster—and to the abbey founded by Alfred's Queen hard by, as to interfere with each other's services by bell-ringing, &c. The properties of the Abbey of New Minster were regranted to Hyde with some further additions of land and privileges.

New Minster was dedicated in 903 to the Blessed Trinity, Our Lady, and St. Peter by King Edward the Elder, son of Alfred, and consecrated by Archbishop Plegmund. Edward transferred the remains of his father and mother to the new church on its completion, and placed secular Canons in the Abbey. After a tenancy of sixty years or so, the disorders within the monastery were stopped by the Ecclesiastical and Civil Authorities combined, and the Canons who would not take the monk's habit were dismissed and monks brought from Abingdon to replace them. For about a century little is chronicled about the Abbey, but Alwy, brother of Earl Godwin, who succeeded to the Abbacy in the latter half of Edward the Confessor's reign, took part with Harold, his nephew, with twelve monks and twenty soldiers against the Conqueror, and was killed. William I. then seized the Abbey Estates, and kept the Abbacy for two years before allowing an Abbot to be chosen, and alienated their narrow enclosure.

Relenting after two years, the King elected Wulfric, and gave back part of the Abbey and other possessions in exchange for some he still kept.

During the whole of Rufus' reign New Minster was in the hands of Passflebere, the king's agent. A temporary end of the monks' troubles came at the accession of Henry I., when a regular abbot was chosen from the cathedral—Hugh, renowned for piety and monastic discipline. It was in this reign the removal to Hyde took place. Hyde Abbey had been erected for the monks by Giffard, Bishop of Winchester, at the instance of the King, and the buildings were on a sumptuous scale. One of the privileges extended to Hyde was enjoyed by the monks when at New Minster, viz., the possession with the monks of the cathedral to St. James's Church above the castle. St. Peter was chosen patron of Hyde, though it was sometimes known as St. Grimbaldus and sometimes as St. Barnabas.

In 1140, *temp.* Stephen and Maud, the Abbey was burnt down, and the Great Cross given to New Minster by Canute robbed of its gold and silver by Henri de Blois, which was melted in the burning Abbey. He is supposed to have been the incendiary. The damage done to the Abbey amounted to 4,862*l.* 13s. 4d. of the money of the time. The monks instituted Canonical process against him, and Bernard, Abbot of Clereval, helped them in their appeal, which was so powerful, that in 1151 the Bishop had to go to Rome to clear himself. He reconsecrated the cross ten years later, after having carefully restored it.

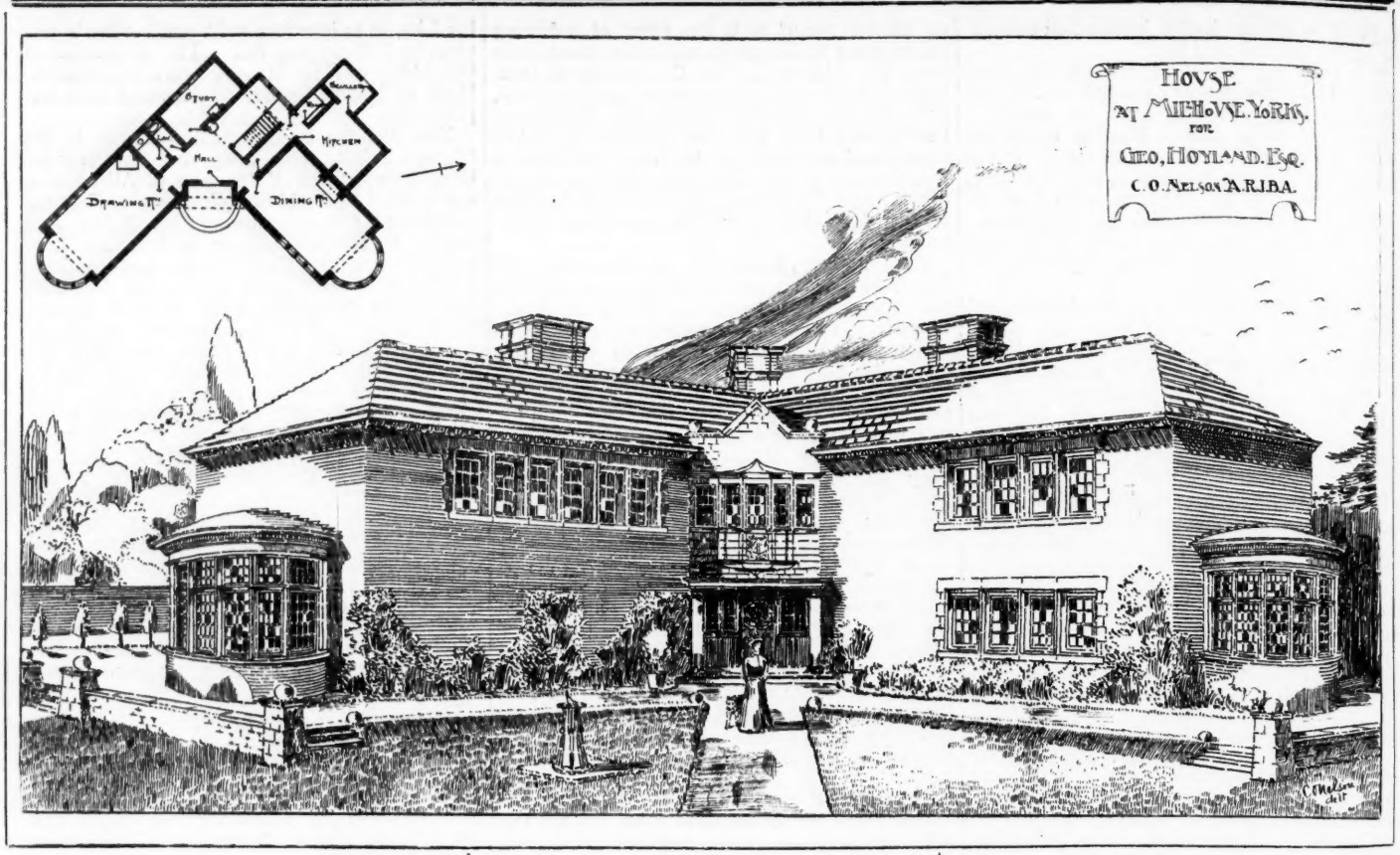
The church and abbey were rebuilt with great magnificence in Henry II.'s reign, and it soon became one of the most distinguished houses of the kingdom, the Abbot being one of the twenty-five summuned to the Upper House. The bell-tower was destroyed by fire in 1445, with its peal of eight bells.

The last Abbot was John Sulcot, who came from Holm, Norfolk. He was instrumental in getting his University (Cambridge) to comply with the King's divorce, and was consequently promoted, April 19, 1539, to Bangor Cathedral, and allowed to hold Hyde *in commendam*. For his "good services" in promptly giving up the Abbey in 1538, and getting twenty-one of his monks to join him, he was further "preferred," in 1539, to Salisbury, which See he governed for eighteen years. He was buried in that Cathedral.

The value of Hyde Abbey at the Dissolution is given as 865*l.* 18s. 0¾d. (Dugdale), and 865*l.* 1s. 6¾d. (Speed); and the site was granted, 37 Henry VIII., to Richard Bethell, who promptly pulled down the buildings. Leland, writing after Wriothesley had held it for a term of years, said it existed no longer. In Camden's time the remains were still fairly extensive.

King Alfred's remains were undisturbed till 1788, when the Corporation of Winchester required a site for a prison, which was erected on part of the space occupied by the Abbey Church, and capitals of columns and other ornaments were dug up all over the city, especially here. The prison was demolished in 1850.

The Registers were important, notably the Liber de Hyda. The seal of the Abbey is nearly perfect.



The site is included in the 35 acres of land just recently acquired by the Winchester Corporation as used for a recreation ground, and the gateway is likewise now the property of that city, through the generosity of Mr. Barrow Simonds.

It is impossible, of course, in the above short notice, to more than slightly allude to some of the salient points of interest in the history of Hyde Abbey; but it will serve its purpose if it arouses some public interest in the Abbey of a less local nature. J. A. R.

HOUSE AT MILLHOUSE.

THIS house, to be built for Mr. Geo. Hoyland, will be finely situated for moor views. Local stone will be used, with brick inside stone, slates, and rock stone dressings. Mr. C. O. Nelson, of London, is the architect.

MAGAZINES AND REVIEWS.*

THE *Art Journal* contains the continuation of an essay by Mr. Claude Phillips on the Wallace collection, dealing in this number with the Watteau pictures, and constituting an admirable critical essay on the art of Watteau, so often misunderstood and regarded as frivolous though graceful in its human element. As Mr. Phillips fully recognises and eloquently points out, Watteau's scenes are really full of human passion, but it is passion restrained in expression by the social manners of that outwardly conventional period, when "the modish Cupid of the day" not less effectually "shrilled his tinsel shaft." The exquisite picture entitled "La Fontaine" fully merits, not only in originality and grace of composition, but in real feeling, all that Mr. Phillips says of it. Mr. Montbard continues his effective pen-and-pencil sketches of the capital of Morocco. A notice of Mr. S. J. Hodson's art is given by Mr. Lewis Lusk, under the title "A Painter of Romantic Cities," with various illustrations from his pictures; a subject certainly interesting to us, though we cannot help feeling that Mr. Hodson, whose architectural pictures are very complete and correct, somewhat fails to convey the element suggested by the title of the article, and is accurate rather than romantic. An article on "Scenes of the Chase Applied to Decoration," by Miss Beatrice L. Thompson, deals with a very interesting subject. One point with the author is that sporting subjects were treated as of much more artistic importance by the ancients than by the moderns; as she says, there are plenty of hunting pictures on the walls of our annual exhibitions, but none of them are of any permanent importance in art. She seems rather inclined to dismiss Landseer in the same category; but that would be a mistake. Landseer's stag pictures were not decorative, certainly, because in England in his day no one thought much about decorative art; but they are very fine and powerful works, and will not be forgotten. Fox-hunting certainly has not had its Landseer, or its decorative painter either; but does it, after all, present much attraction for a great painter? And one reason for the prevalence of hunting scenes in antique art is that life was less complex then, and painting dealt with line and movement rather than with emotional expression. It is well, however, that the possibility of doing something more important in art with modern sporting subjects should be suggested.

The *Magazine of Art* devotes an article, written by Mr. B. Kendell, to that fine French painter of idealised figure subjects, M. Raphaël Collin, whose genius and style are judged by the critic both with sympathy and discrimination. M. Collin is not a powerful painter, and can hardly be called a great one; but no painter of the day, perhaps, has been more refined, and has shown more variety, grace, or poetic feeling, in his treatment of the figure as a medium of decorative effect and of ideal suggestion. In the latter respect the two panels in the Opéra Comique illustrating "La Chanson Légère" and "L'Ode," of which small illustrations are given, are very happily characteristic of his way of embodying a poetic ideal in a figure. His larger and much more important picture, "L'Inspiration," which we noticed at the time of its appearance at the Salon, would have been worth a separate plate; the small scale illustration only gives a very inadequate idea of it. We have, however, two large-size reproductions from figure studies by the artist. The remainder of the number is largely occupied with reviews of this year's exhibitions—the Salon, the Academy, and the Guildhall. In reference to landscape at the Academy, is a remark with which we entirely sympathise. The writer (Mr. Spielmann) observes that the British school of landscape, "at least as illustrated at the Royal Academy," has resisted the incursion of the tendency to regard Nature as a mere material for the solution of light and colour problems. The theories of *luministes*, *pointillistes*, &c., Mr. Spielmann remarks, "are interesting and to be encouraged, but commonly stop short of what ought to be the ultimate aim of a complete work of art. A scrap of landscape, without arrangement or charm of selection or composition, is frequently taken as an excuse for showing how well—perhaps how unprecedentedly well, the painter can suggest blinding sunlight and mysterious shadow. This may be good sunlight painting, but it is not landscape painting:" a caution which is very much needed. There is a short article with some illustrations on "Wood-carving of Mr. J. Phillips," a carver of talent and originality who is to a great extent working with architects in carving ornamental detail. Mr. Phillips appears to be going back to Nature in the endeavour after originality—a course which is tempting but dangerous, when we have to do with architectural carving. In the altar frontal for instance, which forms one of the illustrations, the symmetrical ornament in the panels is very good, but the naturalistic ornament on the uprights is far too ragged, both in itself and in relation to the panels. Every great style of decoration has refused this kind of irregular work; it is a variety no doubt, but it is beside the true end of architectural decoration.

In the *Berlin Architektur-Welt* the leading subject is the "Neues Romanisches Haus," an immense building for shops and dwellings, and including a café, of which Herr F. Schwecten is the architect, but which in its general style might almost be taken to be the work of Richardson. It is, of course, as its name implies, based on the same style on which Richardson founded his architecture; there is, however, a coarseness and showiness about some of the details which we do not find in the American architect's work. It is, however, a powerful and interesting building, the plan of which shows clever treatment of a very irregularly-shaped site. Among the other illustrations in the number are some pretty interiors of dressing-rooms by Carl Müller & Co., a Berlin firm of decorators, which have less than usual of the restlessness of the "Art Nouveau" about them. A double-page illustration of the ceiling of an entertainment-room, painted in a brilliant though somewhat rampant style by Herr Max Koch, is another of the special features of the September issue.

Parts 7 and 8 of vol. viii. of the *Architectural Review* (Boston) contain much interesting matter in both illustrations and text. In Part 7 we have an article with illustrations on "A House of the Transitional Period," which in American architectural history means, apparently, the modern Academical Classic architecture which succeeded the old Colonial period, and preceded the later architectural developments of the United States. The house in question, called "The Old Bennett House," New Bedford, is certainly a remarkable one; a centre block with a pediment and a hexastyle Ionic portico, with detached wings, set back and connected by low buildings to the centre block and decorated with each with a tetrastyle portico on a smaller scale. The writer of the article (Mr. Wheeler Dow) observes—"I should not recommend to a client his exploiting an

* Unavoidably postponed from last week.

exact replica of the Bennett House, but what a superb suggestion it supplies for modern development!" a sentiment in which we entirely concur. Many of these old symmetrical Classic houses, however unsuitable for precise reproduction as modern dwellings, afford noble types on which to work afresh. It is a pity that a plan of it was not given, for, in the way of modern adaptation, that is of course the root of the matter. The building for the North American Trust Company, at Havana (Messrs. York & Sawyer), is based on a triangular plan with the outer angle rounded off into a nearly half-circle—a very suggestive form of plan of which the most has not been made; the treatment of the rounded portion is weak and wanting in character, and large circular-headed windows on a circular plan are not desirable features. "The Problem of the Store Front," by Mr. R. Coolidge, is an interesting article with a number of illustrations of various executed commercial buildings, none of them however, to our thinking, of very good architectural quality. Mr. Coolidge bestows much praise on Mr. Stephen Codman's latest commercial structure, the Pelham building at Boston, which he calls "the last word in design for a building whose greatest need is light." Steel columns encased in splayed mullions of granite carry the floors, and these mullions of granite-casing run up the greater part of the front in vertical lines, the whole space between them being window and the edges of the floors; but the proportions are far too thin for mullions which appear to the eye to be of granite; moreover, they give the impression of a much smaller scale than the actual one. In Part 8 "Office Lettering," (*i.e.* the writing on plans), by Mr. F. Chouteau Brown, deals with a minor subject which will interest many English architects, who bestow a good deal of thought and consideration on lettering; a matter not unworthy of special attention. Some of the alphabets of capitals are very good, but we hardly sympathise with the rather mechanical system of designing letters which is illustrated, in which the bow-pen takes a larger part than the free hand. The sheets of details of the Massachusetts Horticultural Society's building (Messrs. Wheelwright & Haven) are valuable and interesting; but Messrs. Maginnis, Walsh, & Sullivan's St. Mary's Church, Taunton (Mass.) is a very weak piece of modern quasi-Gothic.

The *Artist* contains an illustrated article on the work of a very remarkable Russian artist, Sascha Schneider, some of whose designs we have seen before, but whose work is little known in this country. Schneider is a very fine draughtsman of the figure (almost always the male figure, not the female), which, however, he uses almost entirely as the symbol of poetically conceived ideas. Some of his conceptions are very striking and original.

Every one interested either in the approaching ceremony of the Coronation or in the preservation of Westminster Abbey from injury or danger to its fabric, should read Mr. Somers Clarke's article in the *Nineteenth Century* on "Westminster Abbey and the Coronation." It is to a great extent historical, and gives some really appalling information as to the way in which the Abbey has been knocked about and misused on former occasions in the course of the erection of vast masses of staging. And, as Mr. Clarke observes, these vast temporary erections actually do away with much of the possible grandeur of the scene. The Abbey itself makes the finest of surroundings for the great ceremonial, and the Abbey has been, to an increasing extent on each successive occasion, despoiled of its beauty in an almost wanton manner. Mr. Clarke has his own suggestions, which he might, however, have explained in more detail. The most prominent feature in them is the proposal for the erection of a great temporary vestibule or hall outside of the west front of the Abbey, which would enable 2,000 persons to see the procession without risk of injury to the building. We do not quite gather what his proposals are for the interior. But we hope his protest against the dangerous and unsightly piling up of mountains of timber scaffolding and seating within the building will receive attention in official quarters.

The *Contemporary Review*, which is generally addicted to grave subjects of a political and moral cast, has launched out into two papers on artistic questions, placed together, evidently as having some connexion in idea. The first is by the able and thoughtful lady who writes under the name of "Vernon Lee," but who in this paper hardly shows her usual intellectual discernment. It is entitled "Art and Usefulness;" and as soon as we see the title we know what to expect. It is the old pet heresy of Ruskin and of other critics of his school dressed up afresh—that art is only craftsmanship; that "furniture and utensils; things which exist because we require them, which we know because we employ them, these are the type of all great works of art." "Vernon Lee" indeed does seem to admit some sort of difficulty in putting craft in the some category as works of imagination:—

> "I call *Art* whatever kind of process, intellectual and technical, creates, incidentally or purposely, visible or audible forms, and creates them under the regulation of this æsthetic instinct. Art, therefore, is art whenever any object or any action, or any arrangement, besides being such as to serve a practical purpose or express an emotion or transfer a thought, is such also as to afford the *sui generis* satisfaction which we denote by the adjective: beautiful. But, asks the reader, if every human activity resulting in visible or audible form is to be considered, at least potentially, as art; what becomes of *art* as distinguished from *craft*, or rather what is the difference between what we all mean by art and what we all mean by *craft*?
>
> To this objection, perfectly justified by the facts of our own day, I would answer quite simply: There is no necessary or essential distinction between what we call *art* and what we call *craft*. It is a pure accident, and in all probability a temporary one, which has momentarily separated the two in the last hundred years. Throughout the previous part of the world's history art and craft have been one and the same, at the utmost distinguishable only from a different point of view; *craft* from the practical side, *art* from the contemplative."

So that there is no essential difference, but only an accidental one, between a picture and a wheelbarrow, and things "to serve a practical purpose *or* express an emotion" are things in the same category. "The sonnet or the serenade are useful to the romantic lover in the same manner that carriage-horses and fine clothes are useful to the man who woos more practically-minded ladies." One is loth to speak disrespectfully of such a writer as "Vernon Lee," but we must say that greater nonsense, a more hopeless confusing of things essentially distinct, we never read. And then Vernon Lee endeavours to insinuate that the contemplation of art apart from any end of utility is something frivolous, and that our consciences feel it to be so:—

> "If we examine into our own feelings, we shall find that even for the most art-loving of us the hours spent in galleries of pictures and statues, or listening to music at concerts, are largely stolen from our real life of real interests and real pleasures; that there enters into them a great proportion of effort and boredom; at the very best that we do not enjoy (nor expect to enjoy) them at all in the same degree as a dinner in good company, or a walk in bright, bracing weather, let alone, of course, fishing, or hunting, or digging and weeding our little garden" (!)

If that is the way the writer feels in regard to the enjoyment of a fine picture exhibition or a great symphony, we can only say that we are very sorry for her; but she may be assured that there are persons who enjoy these things in a different spirit, and with no feeling of "boredom." All this kind of talk is the result of the modern rage for trying to explain all our pleasure in art, and all the meaning of art; whereas the highest art is not explainable, either in itself or in its influence on us; and as soon as we try to explain we mar it. The succeeding article in the *Contemporary* is by an American lady, Miss (or Mrs.) Ada Cone, and is entitled "The Art Problem in the United States." To some extent we are in sympathy with this article, for it is in part an attack on the American worship of French art, and the idea that America can be made artistic by assimilating the school and the methods of French art. She says, and we think truly—

> "The adoption of this course in America is a threatened disaster. For, on the one hand, the characteristics of this art are such that the nation which borrows them necessarily puts a clog on the development of its natural æsthetic expression; and, on the other hand, if we look at the conditions of American life, it appears evident that a people in these conditions which takes European fine art to be a suitable channel for its own expression is a people which has mistaken its way."

This is quite true; we have long regretted, and some thoughtful Americans have regretted, this tendency to make a French art in America, instead of endeavouring to create an American art. But a little further on we find that Ada Cone is attacking French art, and in fact all that is called fine art, in itself, and is in the same condemnation with Vernon Lee:—

> "And what is modern fine art? A work divorced from utility as its first condition, and, therefore, separated from the people. A representation of life, of history, of dogma, isolated in a frame, or otherwise detached from its surroundings, an intellectual idea clothed by art laws, in which the intellectual tends to prime the æsthetic, which itself is reduced to a question of processes scarcely appreciated outside the profession except by critics specially trained. This art necessitates an artificial method of instruction. It is learned; however interesting, it is a dead language."

It is perfectly true that fine art demands an intellectual training to understand it; "the people," so far as we take that to mean the mass of the untrained or little trained intellects, do not understand it—and never will, until (if ever that time comes) the present level of education of the best instructed classes is that of the people generally. But to pour contempt on art because it is so intellectual a pleasure that intellectual training is required to enter into it, is about the oddest paradox we have heard of. Some of the author's remarks on French industrial art are, however, true enough, and we may also thank her for a spirited attack on Rodin-worship, and on the collection of curiosities and indecencies which were to be seen in his special pavilion at the 1900 Exhibition.

Under "The Field of Art" in *Scribner's Magazine*, Mr. F. Crowninshield considers the subject of architectural decoration in the form of "a mural painter's letter to his pupils." What he is driving at is not very clear, but apparently he is trying to hold the scales between archæology and invention in decoration; and his conclusion is that "there are plenty of new things to be done on guaranteed lines, plenty of new inspirations to be cajoled from Nature if she be humoured and studied. The expressions of them must be very largely in terms of the past, modified to meet new thought and feeling." That is a reasonable position. We cannot make all art over again, with the idea of being original; but there is much more scope for originality within academic lines than is generally realised, because people are so often content to be academic merely, instead of striving to put a new spirit into the academic framework. As to "Art Nouveau" Mr. Crowninshield speaks out bravely:—

> "There never has been, nor ever will be an art nouveau in the sense that its disciples would have us believe, unless there is to be a Man Nouveau. Human taste is essentially the result of aggregated experience, and the old man must be taken into account. There may indeed be novelty, but not necessarily art. Follow the course of art down the perspective of years from its infancy to the present day, and you will never find a 'new art' at any specified moment. It is a gradual evolution. If at times a new art has seemed to burst suddenly into being, it is only because the missing links have been undetected. Archæology has taught us this much, and let us be grateful. The geniuses added their grain of personality to accumulated knowledge, not a great deal, but enough to give interest and the personal note, the *sine qua non* of all great things; but none of them ever dreamed of throwing off the past and starting *ab initio*. Yet this is just what the clamourer for new things would do. They exact too much. They throw off too much. If they knew more, if they retained more, they would give more. Nor do they seem to have any sense of the humorous. To the uninitiated this lack of humour is less obvious in their decorative design where the figure is eliminated. But where there are figures, how ludicrous they often are! Lanky, malarious, grotesque; affected even to absurdity! And their decorative forms are ludicrous, too. On the table before me there lies an amusing reproduction of a restless interior, the latest expression perhaps of Art Nouveau. On its wall a stringy scheme swirls from wainscot to ceiling in fatuous lines. Liberated telegraph wires, snarled and swayed by the storm, seem to be the fundamental motive of another decorative scheme."

This is really refreshing reading.

In the *Century* we have a description and illustrations of a New York institution which we have not before heard of—viz.: "Mid-air dining clubs." This is one use apparently to which the modern high buildings of New York are put, to provide dining-rooms and restaurants high up in mid-air—

> "Above the smoke and stir of this dim spot
> Which men call earth——"

dining-clubs reached by swift express "elevators" which in a few moments convey the tired business man from the street to a station in the fresh air and with a wide prospect. A good many illustrations of views from these aërial dining-rooms are given. There is something both seductive and not unpractical in the idea, when you have the high buildings; whether it is worth while to crowd a city with them for this purpose is another question. A short article introduces to us an American landscape-painter, W. L. Picknell, now dead, with whose name and works most English people are probably unacquainted. Like most American painters of any note in recent times, he studied and painted for some years in France, and the one illustration given of his work, "The Road to Concarneau," has (as far as we can judge of it in black and white) the style of the best French school of landscape art.

Harper contains an article by Mr. Arthur Symons on "Prague," with illustrations by Mr. Louis Hitchcock. Mr. Symons's powerful faculty of literary expression enables him to give an effective summary of the historic and picturesque interest of Prague, though there is no special architectural perception displayed in it. The small sketch of the Castle of Karlstein is the most interesting of the illustrations. The same number contains a popular but authoritative article on "Cathode Rays," by Dr. J. J. Thompson.

In the *Pall Mall Magazine* Mr. Hugh B. Philpott has indulged in a speculative or prophetic article on "The London of Ten Years Hence." It is an attempt to describe the impression which will be produced in a walk through London from Westminster to St. Paul's, when the Roman Catholic Cathedral, the new Government Offices and War Office, the Strand improvement and new street, the new courts on the site of Newgate, &c., are all completed. The number also contains an article on Israels and his art, by Professor Liebermann. We learn from it that the great Dutch painter began his career in great poverty and earned a bare existence by portrait painting. He lived at that time in the Jews' quarter at Amsterdam. It was not until the age of forty that he developed the type of execution and of subject which has made him famous; until then he painted, as Professor Liebermann puts it, "like any one else." The general estimate of his genius in the article is just and well expressed. It is worth note that Israels considered himself very deficient in technique; a remark of his is quoted to the effect that "no painter except Millet has been less able to draw and paint than I, and yet made such good pictures." There is, indeed, some similarity between him and Millet intellectually, though not, of course, in style and execution.

Feilden's Magazine contains an account, written by Mr. Lewis Longfield, C.E., of "Argentina," the industrial development of the Argentine Republic, which appears to be progressive by leaps and bounds. Mr. Maxwell's papers on "The Town Refuse Problem" are continued, with sections and illustrations of several types of refuse destructor. He sums up with the conclusion that "from experience gained at steam-raising destructor plants it may be accepted that, in suitably designed stations, town refuse may be relied upon to generate high-pressure steam for the generation of electric energy or other uses, that refuse has a fairly definite calorific and commercial value for this purpose, and that its treatment by fire under the conditions dealt with is not only the most sanitary, but also the most economical and perfect method of disposal of the refuse of towns."

The *Engineering Magazine* is largely occupied with the subject of the installation of exhibitions, having an article on "Engineering at the Glasgow Exhibition," on "Mechanical and Electrical Features of the Pan-American Exhibition" (the Buffalo Exhibition), and on "The Engineering Organisation of a Great Exposition." This last article is a summary of the engineering arrangements of the Paris Exhibition of 1900, and is of considerable interest both as a record, and as a guide and suggestion as to what is necessary in future undertakings on a similar great scale.

A copy of the *Engineering Times*, a journal with which we were not previously acquainted, has been sent to us, containing an article on the "National Industrial Association," the object of which is to federate existing employers' and trade-union organisations, "with the main object of promoting a feeling of common interest between masters and men." It is pointed out that there is at present no association in existence which represents both employers and employed; it is desired to make the Association in question a means of doing this, and of convincing both sides that their interests are identical. That is of course just what is wanted to put an end to strikes and lock-outs; many efforts have been made to that end with only partial and temporary success. If the National Industrial Association can achieve this end it will have done a great work.

In the *Revue Générale* M. Louis Humblet has an interesting critical article under the title "Plume et Pinceau," an attempt to discriminate between the powers of pen and pencil in conveying ideas to the mind. It is a kind of disquisition which perhaps does not lead to very much, for there are so many different points of view from which writing and drawing may be compared; but considerations of this kind at all events serve to stimulate thought in regard to the objects and limits of art.

In the *Cornhill* a very pleasantly written article on "A Byway in the Cotswolds" will put the reader on the trace of a good many interesting old farmhouses and other buildings, which may be missed by the traveller without such hints.

In the *Gentleman's Magazine* Mr. Eric R. Buckley brings together a good deal of curious information in regard to "The Staging of Plays 300 Years Ago."

In *Knowledge* the Rev. J. Bacon's article on "The Capricious Hearing of Certain Sounds at Long Range," evidently based on long and rather special experience and observation, is of interest in regard to the effect of locality on the hearing of fog-signals made by bells or other sound-producers.

Illustrations.

NEW LABORATORIES, NETLEY HOSPITAL.

THE illustration shows a piece of the façade of the new Pathological Institute building, with red brick and Portland stone to match the existing hospital.

We hope to publish the complete plans and general description of the Institute in a future number. The illustration is here given as an example of a very characteristic adaptation of the elements of Classic architecture to a plain piece of building for practical purposes.

The original drawing—which, we may observe, is an exceptionally excellent example of monochrome brush-work—was exhibited at the last Royal Academy.

PARES'S BANK, LEICESTER.

THIS building is now in course of erection for Messrs. Pares's Leicestershire Banking Company as their head offices, and occupies the site of the old buildings.

The new bank is faced externally with Portland stone, the base being of unpolished grey Aberdeen granite. The external sculpture is the work of Mr. Chas. J. Allen, of Liverpool. The banking hall has a domed ceiling of steel construction covered with expanded metal to receive the plastering, the modelled decoration of which has been executed by Mr. G. P. Bankart. The lower portion of the internal walls is lined with unpolished mahogany panelling. The whole of the fittings are polished mahogany. The floors are partly teak and partly marble; the latter work and other marble decorations have been executed by Messrs. Farmer & Brindley. The lead glazing is by Mr. George Wragge. The electroliers and some of the ironwork are the work of the Bromsgrove Guild of Applied Art. Some of the electric standards, name-plates, and other bronze work are by Messrs. Collins & Co., of Leicester.

The contractors for the general building work are Messrs. J. C. Kellett & Son, and the architects Messrs. J. B. Everard & S. Perkins Pick. The total expenditure will amount to nearly 40,000*l*. The drawing was exhibited in this year's Academy.

COTTAGES.

GLAZENWOOD COTTAGE, Guildford, was built for Mr. A. C. Curtis. It is a brick and rough-cast cottage with a slate roof. Mr. Billimore, Guildford, was the builder.

The two gardeners' cottages at Dorking were built for Mr. G. P. Gooch. The walls are 9-in. hollow walls, cement-washed, and white-washed. The roof is of local tiles. The builders are Messrs. Pledge Bros., Dorking.

The proposed gardener's cottage at Lichfield for Mr. F. H. Lloyd, is explained by the plan; the two wings are attached as overflow bachelor quarters from the house, served from the cottage, yet separate from it.

The Artist's Cottage, Bickley, was designed for a site adjacent to a house of similar character, with rough-cast brick walls, red-brick base, red roof, and black paint. It has not been carried out as yet.

Mr. W. Curtis Green and Mr. Arch. C. Dickie are the architects of all the cottages illustrated.

EXAMPLES OF ESSEX BRICKWORK:

FEERING PARISH CHURCH.

THIS is one of many examples to be met with in the county showing brickwork at its best. The county of Essex is peculiarly a brick district, the soil being eminently suitable for the making of bricks, more particularly those of the richest red colour. The bricks are small, not much over 2 in. in thickness, and the joints are wide, owing, no doubt, to the roughness of the hand-process of making; the joints are seldom less than ¾ in. thick, and often more.

The diapering is produced by precisely similar bricks—all headers, but those headers selected which have been fired to a greater extent than the bricks generally. The extra firing produces a rich blue-grey; and with age the tone of the mixed red and blue is delightful.

ARNOLD MITCHELL.

MUNICIPAL ENGINEERS' CONFERENCE AT GLASGOW.

THE sitting of the Municipal Engineers' Section of the Engineering Congress was concluded at Glasgow on Thursday, September 5, Mr. E. G. Mawbey, C.E., Leicester, presiding.

Mr. J. More, jun., C.E., F.R.S.E., read a paper on "Recent Tramway Practice," which called forth considerable discussion.

Mr. A. H. Campbell, Engineer and Surveyor to the East Ham Council, read a paper on the problem of the housing of the labouring classes, with special reference to suburban districts. He said the district of East Ham, growing at the rate of 7,000 persons per annum, and those chiefly of the working classes, afforded probably as good a field as could be found for experience in the problem. The limit of wages which he had in mind in the provision his Council were making was a maximum of 30s. per week. In the provinces, no doubt, this rate would be considerably lower. For the housing of this class the scheme adopted by the East Ham Council was to provide four and five roomed houses, containing 470 superficial feet and 520 superficial feet (available room space) on ground and first floors respectively, at a rental of 5s. 9d. and 6s. 3d. per week (inclusive of all rates, taxes, water, and outgoings). With this idea the scheme was matured, and received official Government approval, providing for the erection of fully 540 separate houses, which, with land charges, formation of roads, and contingencies, made up a total of 120,000*l*. The workman's ideal house should have entrance and exit independent of any other house. To this extent only need it be self-contained, and should have the following accommodation:—(1) A kitchen containing at least 144 superficial feet, net; (2) scullery, with small range, copper, and bath, 90 superficial feet; (3) parlour, usable as a bedroom, 125 superficial feet; and (4) bedroom, 96 superficial feet; total, 435 superficial feet, together with arrangements for coals, water-closet, clothes closets, and larder, all suitably positioned. A house giving the above accommodation should be provided in the London suburbs at an inclusive rental of from 6s. to 6s. 6d. per week, and in the provinces, where building costs, rates, and taxes are lower, at a correspondingly lower rental. It might, no doubt, be desirable to add one or even two bedrooms to the schedule, but the problem before Local Authorities, and given them by the Legislature to carry out, was not the creation of municipal villadoms with their six and seven roomed houses, but the erection of plain, substantial cottages for the respectable lowest-

wage-earning classes, and at rents within their very restricted means. Hence his plea against the ambitious tendency of municipal bodies to compete in accommodation for show with the houses provided by private persons for quite another and better-off class than was ever intended by the framers of the various schemes. A well-defined municipal policy would bring about a better understanding between Public Authorities and private persons whose capital was embarked in house property. In cases known to him in the suburbs of London there were being provided by Local Authorities houses 8s. 6d., 9s. 6d., 10s., and up to 12s. per week of rental. Schemes like that betrayed ignorance, or at least misconception, of their statutory duty.

The President expressed the fear that in many cases the tenants would take lodgers, and the houses be occupied by two or three families. It was just a question whether it was not more advisable to provide two-roomed tenements at a less cost—say about 1s. 6d. a room per week.

Mr. J. Lobley, Hanley, who moved a vote of thanks to Mr. Campbell, said the problem was largely one for London. There was no doubt in providing this class of dwelling Mr. Campbell was doing something not provided by private enterprise, and he took that to be the point from which this question should be regarded by the Authorities. The difficulty in Midland towns was that the public wanted a 7s. house for a 3s. 6d. rent.

Mr. Cooper, Wimbledon, said the bedroom accommodation in Mr. Campbell's plan was not sufficient for a family.

Mr. Munse, Belfast, asserted that houses could be provided at much less cost in Ireland, and that owners of small house property could make 10 per cent. profit on their outlay.

The vote of thanks was accorded.

Mr. Campbell, in reply, said that they had found the demand was for two-bedroomed houses and not one, however small the bedrooms might be. His Authority would not recognise the taking of one penny from the rates.

Mr. F. W. Mager, Walsall, contributed a paper on "Coal-mining Subsidences in relation to Sewerage Works," which in the absence of the author was taken as read.

The Conference closed with a vote of thanks to Mr. Mawbey for presiding.

COMPETITIONS.

INFANTS SCHOOL, HALIFAX.—In the recent competition for Infant School, Halifax, the 1st premiated design was that sent in by Messrs. C. F. L. Horsfall & Son, Halifax.

ENGINEERING SOCIETIES.

THE INSTITUTION OF JUNIOR ENGINEERS.—The summer meeting of this Institution took place at the Three Towns, Devonshire, last month (August 12 to 17). By permission of the Lords Commissioners of the Admiralty, Devonport Dockyard was first inspected. The workshops were visited and H.M.S. *Queen* (battleship) and *Encounter* (third-class cruiser) were seen in course of building. In the afternoon, by special steamer, the party had a rough passage from Plymouth, outside the breakwater, to view the rivers Yealm and Kitley. On the following morning, a steamer kindly provided by Sir John Jackson took the members from the Promenade Pier to H.M.S. gunnery-ship *Cambridge*, and thence to the torpedo-school ship *Defiance*. In the afternoon, the party visited the Keyham Dockyard Extension Works, a scheme so gigantic that it will involve the expenditure of over four millions sterling. When completed, in about four or five years' time, the port will be provided with ten docks and five basins, including a tidal basin of 35½ acres area—1,550 ft. long, 1,000 ft. wide, and 55 ft. deep, communicating with the Hamoaze by a caisson. The Royal Naval Engineering College was visited first on the morning of the next day, under the guidance of members of the Institution in residence at the college. Proceeding afterwards into the Keyham Steam Yard, the nature of the practical training which the students undergo was pointed out, in the section specially set apart for their instruction. The other divisions of the factory were shown, the Dockyard was visited and a number of various vessels of war therein were seen. In the afternoon some of the members went by brake in very unpropitious weather to Lea Moor to view the China Clay Works belonging to Messrs. Martin Brothers, while others took advantage of an invitation received from the agents to go aboard the famous Atlantic liner *Deutschland* on her call at Plymouth. Under the guidance of the superintendent, Mr. W. A. Moore, the Royal William Victualling Yard was visited on the Thursday morning, special attention being paid to the engineering features. The rebuilding work at the Royal Naval Hospital was afterwards inspected. The afternoon and evening were devoted to a steamer excursion on the river Tamar. Arrived at Cothele, the historic house of the Earl of Mount-Edgecumbe was, by his kindness, opened for the members' inspection. Embarking again, the steamer completed the run to Weir Head and returned down stream to Marwellham. On nearing the Three Towns on the passage back, the powerful searchlights from the vessels in the harbour and from various points on land were observed in operation. The Royal Albert Bridge, Saltash, was visited on Friday morning, Mr. Elms acting as guide on behalf of the Divisional Engineer of the Great Western Railway, Mr. T. H. Gibbons. A thorough examination of the renewal work of the lower girders which was going on was made, and the party ascended into the tube, remaining there during the passage of a train across the bridge, so that they might experience its effect. The degree of vibration of the tube was almost imperceptible, a condition due, it was stated, to the satisfactory character of the girder-strengthening work already referred to. In the afternoon the members were entertained by the Mayor of Plymouth, Mr. J. D. Bellamy, to a garden party in Beaumont Park, the use of which for the purpose had been granted by the Corporation. The magistrates, aldermen, councillors, and other local friends were invited, and all the arrangements made for the pleasure of the guests were much appreciated. The summer dinner of the Institution was held in the evening at the new Hotel Continental, a number of Government officials and other gentlemen of the neighbourhood being invited. An incident of the evening was the presentation of an oak stationery cabinet to Mr. F. S. Pilling in token of the members' gratitude for his assiduous services as honorary local secretary of the meeting, a well-deserved compliment. On Saturday the Plymouth Gas Works were visited under the guidance of the manager, Mr. P. S. Hoyte, and the waterworks at Burrator were also inspected. A number of other engineering works were open during the week to the visit of the members, who were received with the greatest cordiality wherever they went.

Books.

Classic Architecture: A Series of Ten Plates Illustrating Typical Examples of the Grecian and Roman Orders. By CHARLES F. MITCHELL and GEO. A. MITCHELL. London: B. T. Batsford. 1901.

THESE plates have been drawn by the authors, who are lecturers on architecture to the Polytechnic School of Architecture, for the use of students preparing for the examinations of the Board of Education, or intending to become students of the Royal Academy and of the Institute of Architects.

Only one typical example is given of each order, which perhaps is sufficient for the purposes of a student; and though the plates are neither so numerous nor so refined in execution as in Normand or Mauch, they are on a larger page, and give the whole columnar height in each order, instead of giving only the capital and base of the column, according to the older received and orthodox method. The student thus gets his eye inured to the proportional appearance of the whole order. Two plates of Greek and Roman ornament are added. The book is a very good publication for its purpose, though we had thought that Mr. Spiers's selection of plates of the Orders had supplied what was wanted for those who could not possess themselves of the larger collections of Normand or Mauch. As that, however, was issued (if we remember right) by the same publisher, we presume he believes there is room for the new publication without injuring the old one.

Euclid's Elements of Geometry. Books I-IV., VI., and XI. Edited for the Use of Schools. By CHARLES SMITH, M.A., and SOPHIE BRYANT, D.Sc. London: Macmillan & Co., Limited. 1901.

"EUCLID" has been a source of worry to schoolboys for more reasons than one during past generations. Teachers of a former day were prone to require their pupils to repeat word for word the demonstrations as expressed in some standard translation of Euclid's Elements. It was, therefore, only natural that many pupils should come to regard the task as one for the memory rather than for the reasoning powers. The teacher apparently found it easier to criticise parrot-like repetition with the convenient aid of a text-book than to encourage thought, and he seldom or never put before his students new theorems for proof, or problems for solution, in their own language. No wonder then that the elements of geometry were thought by the average schoolboy to be dry and useless. In the work now before us we are pleased to find that the language of Simson, Pott, and Todhunter, is by no means scrupulously followed. Moreover, Euclid's own proofs are discarded in cases where they are incomplete or obscure. Instances of such treatment will be found in I. 22 and 24, II. 9 and 10, and III. 26-29. With regard to the four last-mentioned propositions, relating to the properties of circles, it may be said that proof is afforded by superposition, a method which is instructive and has the advantage that each proposition can be proved independently of the others. Again, Euclid's own proofs are given in certain cases, instead of alternatives as suggested by some editors, because the former are justly considered to be easier of comprehension. The definitions and axioms are clearly explained where necessary by interlineated remarks, some useful notes and exercises are printed at the end of each book, and symbols for words are adopted in the text as far as possible in order to facilitate appreciation of the different steps of reasoning. This edition of Euclid's Elements will undoubtedly be of much help to the beginner, and should do something to popularise what is really an interesting as well as a useful science.

By-Laws as to House Drainage and Sanitary Fittings made by the London County Council. Annotated by GERARD J. G. JENSEN and Another. London: The Sanitary Publishing Company. 1901.

THE new "Drainage By-Laws" of the London County Council did not receive the approval of the Local Government Board until June 14, and Mr. Jensen's preface is dated July. No time, therefore, has been lost in issuing this book. Three sets of by-laws are considered:—(1). By-laws prepared under the Public Health (London) Act, 1891, Section 16 (2), relating to the removal and carriage of fæcal or noxious matter, the closing of cesspools, &c. (2). By-laws prepared under Section 39 (1) of the same Act, with respect to water-closets, earth-closets, privies, ashpits, cesspools, and receptacles for dung; and (3). The new "Drainage By-laws," prepared under the Metropolis Management Act, 1855, Section 202, for regulating "the pipes, drains, and other means of communicating with sewers, and the traps and apparatus connected therewith."

The method of procedure adopted by the authors is to append notes to each by-law. In many cases the notes are simply a re-statement, in different words, of the provisions of the by-law. In others, however, they are explanatory and describe various ways of complying with the by-law, illustrations being added for the purpose of further elucidation. We cannot endorse all the interpretations which the authors have given. Thus, the new drainage by-laws state that every drain (other than a subsoil drain) must be so "constructed as to be water-tight and to be capable of resisting a pressure of at least 2 ft. head of water." With reference to this the authors write—"As, owing to the wording of the clause, it would appear at first sight that the by-law requires drains to be tested by water, it may be well to point out that the pressure to be withstood, and not the means by which drains are to be tested, is prescribed; hence, not only the hydraulic but also the pneumatic test may be employed." There can be little doubt that the intention of the authors of the

by-law was to make the water test the *official* method of testing, otherwise they would surely have stated the test-pressure in pounds per square inch, and not as "head of water," and would have stated clearly that the drains *must* be tested by the person who laid them. Perhaps, however, Mr. Jensen's mysterious collaborator, whose name, we are told, "it has been necessary to omit from publication for the present," possesses a knowledge of the intentions of the Council which is denied to the outside architect and builder. Objections might also be raised to some of the author's recommendations, as, for example, the wash-down closet in fig. 7, with the outlet joint at the floor level; but taken as a whole, the notes are distinctly useful, and architects and builders will find it a great convenience to have the three sets of by-laws in one handy volume. A map of the administrative county of London, showing the Metropolitan boroughs, is given as a frontispiece, but as very few streets are shown, the map is of little use in fixing the various boundaries.

List of the Streets and Places in the Administrative County of London. Compiled by the Superintending Architect of the L.C.C. London: P. S. King & Son.

THIS is a tolerably large quarto volume giving in tabular form a complete list of the street names within the county of London, the names which formerly existed and have been abolished being given in italics. The list is, of course, alphabetically arranged, and the pages are ruled for columns as follows: "Name—Locality—Postal District—Parish—City or Metropolitan Borough—County Electoral and Parliamentary Division—Ordnance map sheet (5 in. to a mile)—Year of approval—Date of order—Number of plan—Names abolished—Remarks." It will readily be seen for how many purposes such a list as this will be useful.

Mr. G. L. Gomme, the Clerk to the London County Council, writes a short preface, pointing out the historical interest in many cases of old street names, and implying (as we should have expected) that the London County Council is anxious to avoid altering or tampering with these whenever it can be avoided. Some of our London street names go back many centuries for their origin, and are the last existing witnesses to events or circumstances long forgotten, or at least only known to close students of antiquity. In regard to the new names, Mr. Gomme's remarks indicate that these are being treated in a commendable spirit. A new name, as he observes, should not be a duplication of an existing name; it should in some way indicate associations with the place; it should not suggest false history or false associations. We entirely agree also in the feeling that there is a great deal of interest in names carefully chosen, as compared with what Mr. Gomme rightly calls "the soul-less American custom" of numbering the streets instead of naming them. One is pleased to find that the London County Council interfered to preserve the name of "Ducksfoot Lane," in the City, which it was proposed to incorporate as part of Laurence Pountney Hill. We should have been as sorry to lose "Ducksfoot-Lane" in London as "Naughty Boys' Street" ("Rue des Mauvais Garçons") in Paris.

A very fertile source of interesting names for new streets is to be found in calling them by the names of distinguished men; a method which has been much more constantly pursued in Paris than in London; in fact, in France to have a street of the capital named after you is now almost an honour calculated on by any one who has done anything remarkable. One objection may be that in most cases it only represents general and not local associations. Still it is a source of street-naming which deserves more attention than it has received in London.

Canadian Trade Index. Toronto: Canadian Manufacturers' Association. 1901.

THIS is the title of a publication which has been prepared by the Secretary of the Canadian Manufacturers' Association, Toronto, for the use of British, French, and Spanish importers. The "Index" contains the names of some 800 leading manufacturers of Canada, who have formed themselves into a voluntary association for the purpose of advancing the trading interests of the country. It also contains a brief sketch of the leading export manufactures of Canada. Then follows an alphabetical list of the members of the Association, together with a limited list of the articles made by them. The third part contains an alphabetical list of the articles produced by the various members, under which appear the names of the manufacturers of each. The names of the articles are given in English, French, and Spanish.

Superficial Ready Reckoner for Boards, Deals, Battens, &c. By ROBERT HALL, Builders' Surveyor. London: E. & F. N. Spon. 1s.

THIS is a series of tables of the superficial contents in feet, inches, and parts, of Boards, Deals, Battens, &c., from 1 to 50 ft. in length and from ½ in. to 3 ft. in width. There is nothing but the tables, which it is stated have been carefully compiled, and are presumably correct. They are likely to be very useful to those who are concerned in dealing in wood on a basis of superficial measurement.

BOOKS RECEIVED.

SEWAGE AND THE BACTERIAL PURIFICATION OF SEWAGE. By Samuel Rideal, D.Sc. Second Edition. (London: The Sanitary Publishing Company, Limited.)

LIST OF STREETS AND PLACES IN THE COUNTY OF LONDON. Compiled by the Superintending Architect of the L.C.C. (P. S. King & Son.)

PRACTICAL MATHEMATICS FOR BEGINNERS. By Frank Castle, M.I.M.E. (Macmillan & Co.)

CANADIAN TRADE INDEX. (Canadian Manufacturers' Association, Toronto.)

HALL'S SUPERFICIAL READY RECKONER FOR BOARDS, DEALS, BATTENS, &c. By Robert Hall. (E. & F. N. Spon. 1s.)

EARLY RENAISSANCE ARCHITECTURE IN ENGLAND. By J. Alfred Gotch, F.S.A. (B. T. Batsford.)

The Student's Column.

GAS AND GAS FITTINGS.

12.—INCANDESCENT GAS LIGHTING.

ENERGY LOST IN GENERATING LIGHT.—In all artificial methods of generating light, other than phosphorescent light, more energy is expended in producing heat than in producing light. The large proportion of energy so wasted is indicated in the following table given by Professor Lewes in the Cantor Lectures in 1896:—

Percentage of energy transformed into:	Heat.	Light.
Candles	98	2
Oil lamps	98	2
Coal-gas:—		
Flat flame and argand	98	2
Regenerative	93	6
Incandescent	88	12
Electric light:—		
Geissler tubes	97	3
Arc	90	10
Incandescent	95	5
Magnesium light	85	15
Sunlight	70	30
Glow worms, fireflies, and luminous beetles	1	99

Welsbach System of Lighting.—The foregoing table shows that a marked advance over all the earlier methods of generating light from gas has been made by the discovery of the Welsbach system of lighting. This system consists in heating to brilliant incandescence certain substances in a finely divided condition by means of a non-luminous gas flame. The luminosity of an ordinary luminous flame is due to the presence within it of solid carbon particles heated to incandescence; hence the luminous flame is an incandescent gas-light. The phrase "incandescent gas-light" is, however, usually applied only to light produced by heating by means of a non-luminous gas flame a body which when so heated emits light without simultaneously undergoing permanent chemical change.

The non-luminous flame may be produced by mixing air before the point of ignition with gas containing illuminating hydrocarbons, such as coal-gas; or may be produced by gas free from illuminating hydrocarbons, such as water-gas, which burns in the atmosphere with a non-luminous flame, and which consequently does not require admixture with air before ignition at the burner.

Early Forms of Incandescent Light.—The earliest form of incandescent gaslight was that known as the "limelight" introduced by Drummond in 1826, the lime being heated to incandescence by the intensely hot oxyhydrogen blowpipe flame. In later years cylinders of magnesia and of zirconia were substituted for the lime, but large masses of material, such as are used for limelight purposes, cannot be economically heated to the temperature required to render them incandescent.

After Drummond's discovery attempts were made from time to time to use lime and other earthy oxides in more attenuated form for generating light, and metallic mantles of platinum, or platinum alloyed with other metals, were repeatedly tried, but never proved a commercial success.

Welsbach Patents.—The practical success of the incandescent gas-lighting system is due to Dr. Auer von Welsbach, who, after prolonged investigation, at length succeeded in manufacturing a mantle of commercial value.

In 1885 Welsbach obtained a patent for making mantles by saturating cotton fabric with certain metallic salts, the cotton being subsequently ignited and a skeleton of metallic oxides retaining the meshwork form of the cotton fabric produced. After ignition of the cotton the mantle is exceedingly fragile, and it was of little commercial value until (in 1887) a process was found which enabled the mantles to be handled and transported without damage. This process consisted in dipping the mantle into a solution of collodion, and then allowing the mantle to become dry. The collodion formed an elastic varnish over the mantle which protected it during transport, and which could readily be burnt off the mantle when the latter had been placed in the position in which it was to be used.

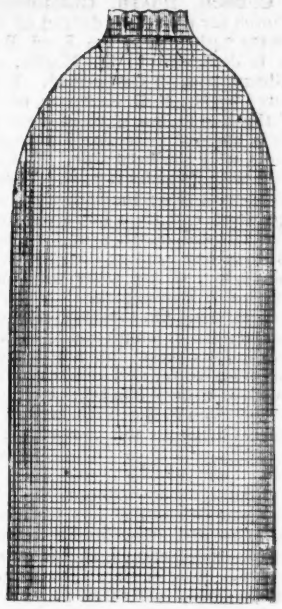
In 1886, Welsbach obtained another patent in which he claimed the use of thoria, used alone or mixed with other earthy oxides.

The mantles sold prior to the year 1891 gave a light of about six candles per cubic foot of gas consumed per hour, and it was believed that this light was emitted by pure thoria. About the year 1891, however, it was discovered that a mantle of pure thoria emitted very little light, but that a mantle consisting of 99 per cent. thoria and 1 per cent. ceria gave the remarkably high efficiency of about 17 candles per cubic foot of gas consumed per hour.

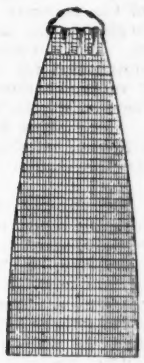
The efficiency of the early thoria mantles is now known to have been due to the presence of a very small proportion of ceria, which existed as an impurity in the commercial thoria used in manufacturing the mantles, and in 1893 Mr. Moeller, of the Welsbach Company, obtained a patent for a mantle consisting of thoria mixed with ceria or certain other rare earthy oxides, in quantities not exceeding 1 or 2 per cent.

Excitants.—A great number of substances have been used for the manufacture of mantles, but it is now recognised that an efficient mantle cannot be made of any pure oxide, and that a small proportion of some other oxide, sometimes termed an "excitant," must also be present. Nearly all the mantles at present in use consist of 99 per cent. of thoria with about 1 per cent. of ceria to act as an excitant.

Theory of Luminosity.—A mantle consisting of about 1 per cent. ceria and 99 per cent. thoria yields the greatest amount of light on an incandescent burner. If the proportion of ceria be materially increased or decreased the light-emitting power of the mantle becomes greatly diminished. Mantles of pure thoria or of pure ceria emit very little light. The nature of the action of the ceria upon the thoria is unknown. Many ingenious theories have been advanced to account for it, but none are entirely satisfactory. Mr. Swinton has proved that the generation of light does not occur if the mantle be heated in a vacuum tube, and it may therefore be assumed that one of the constituents of the atmosphere, probably the oxygen, exerts an important influence upon one or both constituents of the mantle when the thoria and ceria are mixed or combined in the required proportions. Dr. Bunte has suggested that the generation of light is due to intense local temperature produced on the surface of the mantle by combination of the hydrogen of the gas with atmospheric oxygen, brought about by the catalytic action of the ceria. He found by experiment that in the absence of ceria, chemical combination between hydrogen and oxygen, mixed in the proportion of 2 to 1, did not occur below a temperature of 1,200 deg. Fahr., whereas in the presence of ceria the combination took place at a temperature of 600 deg. Fahr. Thoria was found to have no



(*a*) Cotton Hood for Incandescent Mantle Manufacture.



(*b*) Mantle Produced after Burning off the Cotton.

Fig. 26.

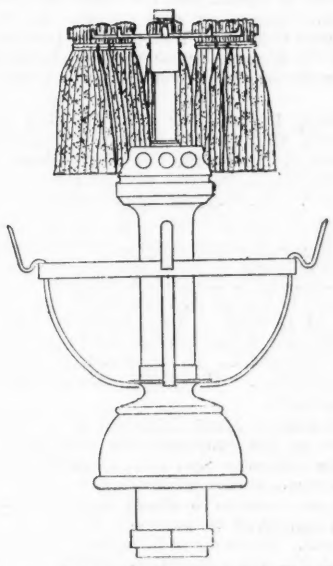


Fig. 27.—De Lery Burner and Tassels.

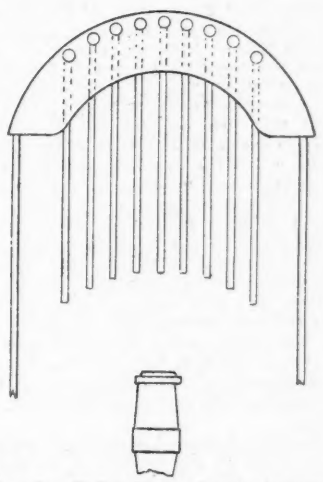


Fig. 28.—Fahnehjelm Comb for Incandescent-Lighting.

influence upon the temperature of which chemical action occurred.

So far as is known, ceria will not act so efficiently as an excitant upon any material other than thoria, and although other materials may be used as excitants for thoria, none are so efficient as ceria.

Many cases are known in which two dissimilar substances will not enter into chemical combination unless a third body be present, which, however, itself undergoes no permament chemical change, and the influence exerted by this third body is spoken of as "catalytic action." The cause of catalytic action is not yet known, and the use of the term by modern chemists is akin to the fatuous explanation of the action of the common pump given by ancient philosophers when they said that "Nature abhors a vacuum."

Pink "Sunlight" Mantles. — Other oxides than those of thorium and cerium have the power, when mixed in certain combinations, of emitting light when used in the form of mantles for gas flames. The pink "Sunlight" mantle, which emits a golden-yellow light, consists of the oxides of aluminium and chromium; zirconia may also be added, but merely acts as a neutral constituent without affecting the lighting efficiency of the mantle. Mantles of pure alumina or of pure chromic oxide have little or no light-emitting power, but when the two oxides are combined in certain proportions the mantle of mixed oxides gives a light efficiency of about eleven candles per cubic foot of gas consumed per hour. The chromium, however, appears to gradually volatilise under the high temperature of the flame, and in the course of a few weeks the light emitted by the mantle diminishes materially.

Manufacture of Mantles.—To manufacture a mantle for incandescent gas lighting, a network hood (fig. 26*a*) of cotton or other vegetable fibre is soaked in a strong solution of the nitrates of thoria and ceria mixed in the correct proportions. The mantle is then passed through a small wringer, dried, stretched into suitable shape on a wooden or glass mould, and then, with the aid of a gas flame, the cotton is ignited. The hood while burning shrinks considerably (fig. 26*b*), and a fragile mantle of oxides in the desired shape is obtained; the conversion of the nitrates into oxides is usually completed by heating the mantle over a blast flame, which also has the effect of strengthening the mantle. Finally, the mantle is trimmed into shape and "collodionised."

The object of dipping the mantle into a solution of collodion, or some substance of a similar flexible nature, is to render it less liable to breakage when handled and during transport; and as soon as the mantle is placed upon the burner and a flame applied to it, the collodion burns away and leaves the fragile network of oxides.

Collodion Mantles.—Instead of making mantles by soaking cotton fabrics in solutions of the salts, they are now extensively manufactured by mixing the salts into a paste with collodion solution, then squeezing the paste into threads through capillary tubes under pressure, and finally weaving the dried thread into a network hood similar in shape to that made from cotton fabric.

When the collodion is burnt off, the network of oxides forming the mantle may be distinguished from the mantle made by the use of a cotton hood by examination under the microscope. The threads from the collodion mantles appear like loose bundles of rods, while the threads from mantles made with cotton, after the cotton has been burnt off, have a fluted and more compact appearance.

Shape of Incandescent Mantle.—In this country mantles of the Welsbach shape are at present universally used, but in America the De Lery tassels arranged in a circle around a rose burner (fig. 27) are being extensively used. These tassels are, we believe, similar in composition to the Welsbach mantles, although they do not give so great an illuminating power per unit of gas consumed, but their effect is more pleasing to the eye, owing to the absence of the irritating glare common to mantles of the Welsbach shape.

Attempts have also been made to adapt incandescing bodies to non-luminous flat flames. Fahnehjelm, of Stockholm, introduced (in 1885) a comb consisting of a number of thin magnesia rods, set in a fireclay back, having an iron frame. This comb (fig. 28) was suspended over the non-luminous flame. If water-gas were used the gas was consumed in a small Bray burner, but the comb was never very successful, owing to the volatility of the magnesia.

The "fringe" or "plume" subsequently invented by De Mare was a somewhat similar device, but was more successful, owing to its being composed of non-volatile rare earths having a greater light emissivity. The use of these rare earths, however, was in this country held to be an infringement of a Welsbach patent.

Value of Different Gases for Incandescent Lighting.—It is often stated that the value of gas for incandescent lighting is directly proportionate to its calorific power, and Mr. Foulis has published the following figures, which appear to support that statement, since the calorific value of plain coal-gas increases with the illuminating power :—

Illuminating Power. Flat flame, corrected to 5 cubic feet per hour. Candles.		Illuminating Power. Incandescent burner, corrected to 5 cubic feet per hour. Candles.
23·1	.....	117·3
17·9	.....	90·3
16·2	.....	87·9
14·6	.....	84·4
13·5	.....	81·9

Dr. Bunte and Dr. Strache have, on the other hand, shown that as high an efficiency for incandescent lighting may be obtained from gases of much lower calorific value, as from coal-gas. Dr. Bunte experimented with coal-gas alone and then with coal-gas mixed with certain other gases, and found that the addition of 20 per cent. of water-gas to the coal-gas does not diminish its efficiency for incandescent lighting, although it materially reduces its illuminating power for flat-flame lighting, and also its calorific value. The following are some of the results obtained by Dr. Bunte :—

	Slit burner. 5½ cubic feet per hour. Hefner candles.		Welsbach incandescent burner. 3·53 cubic feet per hour. Hefner candles.
Coal-gas	15·0	.....	70·0
Coal-gas, with 20 per cent. water-gas ...	3·1	.....	73·5
Coal-gas, with 20 per cent. carbon monoxide.....	2·8	.....	59·5
Coal-gas, with 20 per cent. hydrogen ...	7·3	.....	70·0
Coal-gas, with 20 per cent. marsh-gas ...	12·5	.....	61·6
Coal-gas, with 25 per cent. ethylene.....	40·0	.....	95·2
Coal-gas, carburetted with benzol	25·0	.....	75·6

The Hefner-Alteneck amyl-acetate lamp is extensively used in Germany as a standard of light, and a Hefner candle is equivalent to 0·877 of an English standard candle.

Dr. Strache has devised a number of incandescent burners for consuming plain water-gas possessing about one-half the calorific value of coal-gas. The water-gas flame being non-luminous, it is not necessary to mix air with the gas before the point of ignition, and Dr. Strache finds that the plain water-gas is quite as efficient for incandescent lighting as coal-gas. In fact, it will be seen from the following figures published by him that he claims a considerably

higher efficiency for water-gas than for coal-gas :—

Incandescent light.	Consumption per 1,000 candle hours.	Heat developed per 1,000 candle hours.	Oxygen consumed per 1,000 candle hours.
	Cubic feet.	Calories.	Cubic feet.
Water-gas ...	52·4	3,710	24 6
Coal-gas.....	84·5	11,970	103·1

Dr. Strache claims for incandescent lighting with plain water-gas that a very white light of great brilliancy is obtained, and that, compared with incandescent lighting with coal-gas, it has the advantage of emitting less heat per unit of light, that less atmospheric oxygen is consumed and less carbon dioxide produced, and that as air is not mixed with the gas before the point of ignition, the flame can never "flash back." Also that, owing to the absence of hydrocarbons in the gas, the flame never smokes, and carbon is never deposited upon the mantle.

It is evident, therefore, that the value of gas for incandescent lighting as used at the present time is not solely dependent upon its calorific power, but that the flame temperature per unit of area must also be taken into consideration. Water-gas when consumed in an argand burner at the rate of 5 cubic feet per hour gives a flame 1 in. in height, whereas coal-gas consumed at the same rate gives a flame from 2½ in. to 3 in. in height. Hence a given area of water-gas flame may be of a higher temperature than a similar area of coal-gas flame, although the total heat of the coal-gas flame per unit of gas consumed is twice as great as that of the water-gas flame.

Possibly a method may presently be discovered of causing the coal-gas to burn with a shorter flame (as it does in high-pressure systems), and a higher value for incandescent lighting be obtained from it.

In a paper read at the recent Engineering Congress at Glasgow Professor Lewes ascribed the high lighting efficiency of water-gas to the fact that it does not require admixture with air before the point of ignition, that the inner cone of flame formed in coal-gas burners is therefore absent, and that consequently there is "little or no difference in the temperature of the outer zones of the flames in which the mantle is heated." It is possible that this may be the correct explanation, but extensive experimental investigation is yet required into the relationship between light and heat in the Welsbach system of lighting.

OBITUARY.

MR. LLOYD.—We regret to announce the death, at Redditch, through misadventure, on the 12th instant, of Mr. Herbert R. Lloyd, of Birmingham and Redditch, architect and surveyor, aged thirty-nine years. Mr. Lloyd was a well-known man, and was highly respected. Of his more recent professional works we may mention the restoration, as completed in August, 1898, of St. Mary's Church, at Cowes, in the Isle of Wight; the new Technical Schools at Redditch, comprising carpenters' and smiths' shops, a lecture theatre, and (in the top room) a museum gallery, which were opened in October of last year; and a church and Sunday school for the United Methodists, at Mount Pleasant, Redditch, opened just twelve months ago. Mr. Lloyd and Mr. Henry T. Hare, as joint architects, prepared the plans and designs for the new Isolation Hospital at Hill Top, Bromsgrove, for the Bromsgrove, Droitwich, and Redditch Joint Boards, in respect of which a contract-tender of 10,080*l.* by Messrs. J. & A., Brazier, of Bromsgrove, was accepted in December last.

GENERAL BUILDING NEWS.

MEMORIAL CHURCH, LLANDUDNO.—On the 4th inst. the Bishop of St. Asaph consecrated St. Paul's Church, better known as the Duke of Clarence Memorial Church, at Craigydon, Llandudno. Sittings are provided for 950 worshippers. The style is Early English, and the building consists of a nave, 94 ft. long by 28 ft. wide, with north and south arcades, and entrances towards the west and south, a chancel 37 ft. long and 25 ft. high, with an aisle or chapel on one side, and vestries and organ chamber on the other. The tower and spire will stand at the south-west angle of the nave. The church is built of local limestone, with dressings of Bromsgrove stone The architect of the church was Mr. Oldrid Scott.

CHURCH, CROOKESMOOR, SHEFFIELD. — The scheme for the formation of the new parochial district of St. Nathaniel, Crookesmoor, is now complete, and the foundation-stone of the parish church will be laid on October 7. The site of the church is in Roebuck-road. When complete the building will seat a congregation of 700; but the funds do not permit the signing of the contract at present for the completion of the church, and consequently the nave is to be built first. Without the chancel, there will be seating accommodation for a congregation of 580. The front of the building will be in Roebuck-road, and there will also be an entrance from Chatwin-street. The plans have been prepared by Mr. Joseph Norton, of Sheffield, and the total cost of building the church will be about 7,000*l.*

RESTORATION OF LLANDENNY CHURCH.—The Bishop of Llandaff recently reopened the restored parish church of Llandenny, near Usk. The diocesan surveyor, Mr. G. E. Halliday, of Cardiff, was the architect of the restoration, and Mr. Ballinger, of Dingestow, was the contractor. The interior facing of the church has practically been entirely renewed, the plaster stripped and the walls pointed, whilst the tower has been largely restored. During the work an ancient window in the north wall was discovered. This had been hidden from view by a mediæval buttress. The architect says the window is one of the very few remaining fragments of British (or pre-Norman church architecture preserved in the Principality. The opening is only 3 in. wide, and from the wide inner splay it seems to have been used for defensive purposes. The fragment is in very good preservation. A new pulpit has been erected by the parishioners in memory of Queen Victoria. The old lych gate, one of four early examples remaining in the diocese, has been restored.—*South Wales Daily News.*

CONGREGATIONAL CHURCH, NEW CROSS, LONDON.—Lewisham High-road Congregational Church has been renovated and decorated throughout, and the electric light installed. The stonework of the spire has been repointed in cement and treated with a solution of "Fluate," and a new lightning conductor has been fixed by Messrs. E. Beresford & Co., Ludgate Circus, E.C. The repairs and decoration have been carried out by Messrs. J. O. Collingwood & Co., Brockley, S.E.; the electric light installation by Messrs. Braby and Tomlinson, Hart-street, Bloomsbury. The electric fittings were made by Messrs. Evered & Co., Drury-lane, W.C. The whole have been carried out from the designs and under the superintendence of Messrs. Geo. Baines and Reginald Palmer Baines, architects, Clement's-inn, Strand, W.C., at a total cost of about 1,300*l.*

WESLEYAN CHAPEL, COYTRAHEN, GLAMORGANSHIRE.—The foundation-stones were laid recently of the new chapel which is being erected by the Wesleyans at Coytrahen. The contractor is Mr. Jenkin Mathews, and the architects Messrs. E. W. Burnett & Sons.

CHAPEL, BARRY ISLAND.—A new chapel, erected on a spot adjacent to the post-office on Barry Island, in connexion with the Wesleyan denomination, was opened recently. Mr. D. Morgan was the builder, and Mr. G. A. Birkenhead the architect.

WISHART MEMORIAL CHURCH, DUNDEE.—This building has just been erected in King-street, Dundee. There are two entrances from King-street, each of which leads directly into the nave of the church, while the entrance under the square tower also leads to the gallery and the halls below. The stone dressings of the front elevation are of red Dumfriesshire stone, while the infilling is from Burgmuirhead, Forfarshire. The plan is arranged in one large nave and side aisle and transept, and gallery next King-street. The choir and organ galleries are placed in one end of the transept, while the pulpit and platform are erected on the south wall in an apsidal recess, which is lighted by windows on each side. Traceried windows placed in the nave and transept run up into the roof above the wall head to secure better light. A subsidiary staircase from a side street leads to the vestry and choir gallery, minister's vestry, caretaker's-room, and also the halls in the basement. The tradesmen for the various works have been:—Mason, R. Laing, Dundee; joiner, Thomas C. Stocks, Dundee; plumber, J. Crighton & Sons, Dundee; slater, William Brand & Son, Arbroath; plasterer, Michael Lawless, Dundee; glazier, Lindsay & Scott, Dundee; painter, J. Nicholson, Dundee; blacksmith, William Young, Newport; iron and steel, Nicoll & Son, Dundee; heating engineer, A. L. Peacock & Co., Dundee; stained glass, William Meikle & Son, Glasgow; carving, James Bremner, Dundee. The buildings have been erected from plans by and under the superintendence of Mr. T. Martin Cappon, Dundee.

HOLY TRINITY CHURCH, KENSINGTON.—It is stated that Messrs. Stephens, Bastow, & Co., Limited, of Bristol, have been entrusted with the erection of the new Church of Holy Trinity, Kensington, London, S.W., from designs of Mr. George F. Bodley, A.R.A. The church will cost upwards of 30,000*l.*

CHURCH, WALTON, LANCASHIRE.—The foundation-stone of a new Congregational school church, to be erected in Rice-lane, Walton, was laid on the 14th inst. The structure, when completed, will accommodate 350 people, and will cost 3,500*l.* The architects are Messrs. Brigg & Wolstenholme, and the builder Mr. William Mather.

CHURCH, ROATH, GLAMORGANSHIRE.—A new church for the Roath district of Cardiff was opened on the 14th inst. by the Lord Bishop of Llandaff. It is dedicated to St. Martin, and is situated in Albany-road, off Castle-road. The plans were prepared by Mr. F. R. Kempson, of Cardiff. The plan of the church is a nave of four wide bays flanked by a narrow processional aisle on the north side, and a wide southern aisle. The entire width of the nave with its aisles is 71 ft. There is a porch at the north-west side; the wide south aisle terminates at the west end in a baptistry and internal porch. The chancel consists of two open bays and an enclosed bay forming the sanctuary. It is 43 ft. in length, and of the same width as the nave, from which it is now separated by the base of the future rood-screen. On the north side of the chancel is a chapel 42 ft. in length and 15 ft. wide. On the south side of the chancel lies a passage giving access to the choir vestry and sacristy. Above the sacristy an organ gallery has been built, opening through a stone screen to the south aisle of the nave, and on its north side to the chancel. The building is of red brick with stone facings, the roof being of grey slate. The pulpit and font are of warm red stone.

CHAPEL, EAGLESCLIFFE, YORKSHIRE.—The foundation-stone has just been laid at Eaglescliffe of a new Primitive Methodist chapel and school. The building stands at the junction of Witham-avenue. The chapel will be 50 ft. by 30 ft., and the Sunday-school will occupy a space of 30 ft. by 20 ft. The school will be divided from the chapel by an ornamental glazed partition, which can be set aside when it becomes necessary to provide for a larger congregation. The cost, including the land, will amount to 2,200*l.*, and the chapel will have seating accommodation for 250 people. Messrs. Henry Doughty & Sons, of Yarm, are the builders, and Mr. T. W. T. Richardson, of Stockton, is the architect, under whose supervision the work is being carried out.

BANK, LEEDS.—The stone building which the London City and Midland Bank, Limited, have erected at the junction of North-street and Meanwood-road, Leeds, was opened for business on the 9th inst. Mr. W. Bakewell was the architect.

SMALL-POX HOSPITAL, ELSWICK, LANCASHIRE.—A Board of Trade inquiry has just been held into the application of the Fylde, Preston, and Garstang Joint Small-pox Hospital Committee to the County Council to borrow the sum of 18,000*l.* for the erection at Elswick of a small-pox hospital. Accommodation will be provided for thirty-two patients Mr. Edward C. H. Maidman, of Edinburgh, is the architect. His plans were accepted in open competition.

PROPOSED NEW THEATRE FOR ABERDEEN.—Plans of the proposed new theatre for Robert Arthur's Theatre Co., Ltd, at Rosemount-viaduct, between U. F. South Church and Schoolhill station of Great North of Scotland Railway Co, have just been approved of generally by Aberdeen Town Council. These plans have been prepared by Mr. Frank Matcham, architect, London, and have been lodged by Messrs. Brown and Watt, architects, Aberdeen. The building, in the Italian Renaissance style, will be of light grey granite. The frontage to the viaduct is 115 ft., and the estimated cost is upwards of 20,000*l.*

MUNICIPAL OFFICES FOR LOUGHBOROUGH.—The alterations and additions which have been proceeding for some time at the Town Hall, Loughborough, are nearing completion. The Corn Exchange has been improved and enlarged by a new stage, the old platform having been removed, and dressing-rooms, storerooms, kitchen, and other conveniences provided. The place will accommodate 120 additional persons, the capacity being now 750. Corridors run down each side of the hall, connecting at both front and rear of the exchange, and there are seven exits, all the doors opening outwards. On the right of the entrance hall the old Council-chamber has been renovated, and will henceforth be known as the lecture-hall. With regard more particularly to the offices, a strip of land was purchased from the banking company next door to the Town Hall, and upon this what is termed the north corridor has been built, with access from the one side to the Exchange, and on the other to the office of the Borough Accountant, to a cloakroom and lavatory, a clerks' office, and a committee-room, 36 ft. by 15 ft. Coming to the south corridor, which is that running parallel with Town-hall passage outside, is to be found the Borough Surveyor's department. Rate offices are also located in the same corridor, as well as one for the sanitary inspector. Proceeding towards the end of the corridor there is a staircase leading to the Council Chamber, to the Mayor's parlour, and to a retiring room for members of the Corporation. From this corridor a new fireproof staircase has been made to the Victoria-room, leading likewise to the balcony in the Corn Exchange, and taking the place of an old erection of wood. There is an alcove, or small gallery, in the Council Chamber. The whole of the building work, estimated to cost 6,000*l.*, has been carried out by Messrs. Wm. Moss & Sons, Loughborough; the heating (hot-water apparatus) for the entire place has been entrusted to Messenger & Co., and Messrs. Gascoyne & Son, of Nottingham, did the glazier's work. The plans for the alterations

and enlargements were prepared by the Borough Surveyor, Mr. A. H. Walker.

ISOLATION HOSPITAL, FORFAR.—An infectious diseases hospital has been built at Whitebills, Forfar, for the Dundee and Forfar Districts of the Forfar County Council. The buildings consist of a large administrative block, on the east side of which is placed the isolation block, having two wards of one bed each, with nurses' room, bathroom, &c., and to the west of the administrative block is the discharge block, with undressing and dressing rooms, bathroom, and stores for patients' clothes. Along the high ground to the south-east of the administrative block is placed the scarlet fever block, having two wards of eight beds each, and two wards of one bed each for acute cases. The nurses' rooms and pantries are placed between the wards; while the baths are placed in annexes at the end of each ward, connected with the main buildings by through ventilated passages. South-west of the administrative block are placed the typhoid and diphtheria blocks, having two wards of two beds each, with nurses' rooms and other conveniences. The offices are placed at the south end of the ground, out of sight of the other wards, and consist of mortuary, ambulance sheds, tool-house, wash-house and ironing-room, disinfector and boiler-house, coal stores, and other conveniences. The blocks have been placed on the highest ridges of the ground, about 60 ft. apart, and the intervening ground made up to an even surface between. Granolithic footpaths lead from the nurses' entrance in the administrative block to all the other blocks. Telephones connect the various wards with the administrative block. The whole ground is enclosed by a stone wall. The contractors for the various works are as follows:—Messrs. James Cargill & Co., builders, Forfar; Messrs. Alexander Hay & Co., joiners, Forfar; Messrs. William Brand & Son, slaters, Arbroath; Mr. D. Brown, plumber, Dundee; Mr. D. Masterton, plasterer, Forfar; Mr. J. H. Douglas, glazier, Montrose; Messrs. Thomas Bradford & Co., laundry engineers, Manchester; Messrs. A. Westwood & Son, bells and telephones, Dundee; gas main, Messrs. William Mitchell & Son, Dundee; water supply, Messrs. William Mitchell & Son, Dundee; drainage, Messrs. J. Gray & Sons, Newtyle; locks and furniture, Messrs. Eadie & Kininmonth, Forfar; painter work, Messrs. Doig & M'Phee, Forfar; boundary walls, Mr. James M'Lean, Forfar; laying out of grounds, Mr. P. Girrity, Dundee; ventilation, Messrs. R. Boyle & Sons, Limited, Glasgow; grates, Messrs. G. H. Nicoll & Co., Dundee; gates, Mr. A. M'Call, Dundee; furniture and furnishings, Messrs. Thomas Justice & Sons, Limited, Dundee. The clerk of works being the late Mr. D. Kidd, Mr. Drummond has acted as clerk of works since Mr. Kidd's death. The whole works have been carried out from plans and under the superintendence of the architect, Mr. T. Martin Cappon, Dundee.

PUBLIC OFFICES, SELSTON, NOTTINGHAMSHIRE.—Public offices are being erected at Selston for the Parish Council. The architect is Mr. F. Ball, of Nottingham, and the builders are Messrs. Minkley Bros., of Underwood.

THE NATIONAL PHYSICAL LABORATORY.—Good progress is being made with the works for the enlargement and alteration of the house in Bushey Park for purposes of the new National Physical Laboratory, which it is anticipated will be ready for occupation before the end of the year. The basement and ground floor of the old house will be reserved for physical investigations of a delicate kind. A room measuring 80 ft. by 50 ft., and lighted from the north with a weaving-shed roof, has been constructed for engineering work, with a drawing-office and an engine-house close by. Two general laboratories will be fitted up in the main building, which has a substantially constructed central block, about 70 ft. square on plan, upon a vaulted basement containing several rooms, of which the floor has been thickly overlaid with concrete. The outer and inner walls are very thick, and all the conditions are favourable for the prosecution of steady work in even temperatures. A mercury column is being erected for measuring up to 200 lbs. to the square inch; and for minimising vibration, a 60 kilowatt Parsons' turbine will be employed to distribute electrical power to the various laboratories. A comparator, a dividing-engine, and some high-class measuring apparatus have been presented to the laboratory by Sir Andrew Noble. The first work to be undertaken will be the photo-micrographical examination of steel rails, with the testing of the elastic properties of alloys.

SANITARY AND ENGINEERING NEWS.

STAINES SEWAGE SCHEME.—A Local Government Board Inquiry was held on the 3rd inst. by Mr. F. H. Tulloch, M.Inst.C.E., into an application of the Staines Urban District Council for a loan for the construction of sewage filters, which, on the recommendation of General Carey, past Engineer-in-Chief to the Local Government Board, are to contain Polarite, on the same principle as the Polarite filters at the Chorley Corporation Sewage Works. The filters at Chorley were laid down about seven years ago, and are stated to produce an effluent of so high a degree of purity that the Local Government Board have waived their usual stipulation as to the effluent from them passing over land. At Staines, although the works have been most carefully supervised and ample tank accommodation provided, yet the unsuitable nature of the land has given rise to numerous complaints caused by offensive emanations due to secondary decomposition of the tank effluent when on the land; hence it has been found necessary to resort to artificial filtration through powerfully active oxidising beds. There was no opposition to the scheme, and the chairman, at the conclusion of the inquiry, pointed out to the inspector the urgent need of the loan, and the expediency of carrying out the improvements forthwith in order to avoid further complaints. We are informed by the International Purification Syndicate of Westminster, the proprietors of Polarite, that by improved arrangements whereby the sewage is distributed on to the beds by means of automatic revolving sprinklers (Candy-Caink patent), labour on the filters is now reduced to practically nothing.

BRADFORD ELECTRICITY EXTENSION.—The memorial stones have just been laid at Bradford of a new generating station in connexion with the electricity supply works. The buildings—which are to be situated in Valley-road, and to face the Midland Railway on ground adjacent to the second generating station erected by the Corporation—were commenced early in the year, and should have been very shortly ready to receive the plant, but owing to the dispute in the building trades the work has been very much delayed, and it will be impossible now to instal the plant and get into working order before the summer of next year. In order, however, to deal with the increased demand for electricity, arrangements have been made to instal two engines of 300 h.p. each in an extension of the present engine-house. As to provision for still further extension, the buildings are so designed that they may be duplicated by adding another engine-house at the back of the boiler-house, the boiler-house itself being so arranged that the boiler horse-power installed can be doubled to deal with the engines in this second engine-room. The front of the new works will be built in ornamental stonework, and will constitute one side of the new engine-room. The engine-room will run parallel to the roadway, and behind it will be the boiler-house. At the north end of the building will be an economiser house, feed water storage tanks, and ash bunkers. The interior of the engine-room will be built with glazed bricks of an ornamental design. The portion that is being built at present will be capable of accommodating three engines, having a total horse-power of 6,000. The electric generators will each have a capacity of 1,000 kilowatts. Surface condensing plant will be installed to be used in conjunction with these engines, and will be operated in connection with the cooling tower that is now being erected over the reservoir. An electrically-driven 30-ton overhead crane will be installed in the engine-room for the purpose of erecting or repairing any parts of the plant. The engine-room, when built, will be capable of containing five units of plant, having a total capacity of 10,000 horse-power, and the second engine-room at the back of the boiler-house will be of the same capacity. It is intended to instal six boilers, having a total capacity of 4,800 horse-power. The gases from these will pass into a main flue, which will conduct them through an economiser and into the chimney. The chimney will be built of brick, in circular form, with an internal diameter of 13 ft. It is to be 200 ft. high. A large coal store has been arranged over the centre part of the boiler-house. The city electrical engineer is Mr. R. A. Chattock, and Mr. S. T. Dalton, Mr. W. Jones, Mr. E. S. Saunders are assistant engineers; Mr. W. A. Atkinson is clerk of the works; Mr. R. Mawson and Mr. R. Hudson are the architects, and Messrs. Obank the contractors.

LICHFIELD SEWERAGE.—The Lichfield City Council, after interviewing three engineers, have appointed Mr. J. R. Elliott, C.E., of Nottingham, to prepare plans and report upon the city sewerage.

FOREIGN.

FRANCE.—A large tapestry is just being completed at the Gobelins, which is to decorate one of the rooms in the Bibliothèque Nationale. It is after a cartoon by M. Ehrmann, and symbolises the French Renaissance, and includes portrait figures of all the great artists of that period, while the background shows representations of the most celebrated châteaux. The tapestry will complete the series of which the other four tapestries represent "Antiquity," "The Middle Ages," "Writing," and "Printing."——M. Louis Dumoulin has received a State commission to paint a large picture representing the arrival of the Imperial train at one of the stations, either Dunkerque, Reims, or Compiègne.——At the Sèvres factory a room has been devoted to a historic collection of pieces of ceramic ware dating from the first manufacture at Vincennes, under Louis XIV., as well as specimens of the First and Second Empire periods, and works that figured in the Exhibitions of 1889 and 1900.——The Public Works Department has approved of the design for a viaduct at Fades, on the line from Saint-Elvi to Pauniat. This viaduct, which is to cross the deep valley of the Sioule, will be 376 metres in length, and 132 metres in height above the valley level.——The pupils of the Ecole des Beaux-Arts have addressed a memorial to M. Paul Dubois, the eminent sculptor who directs the establishment, petitioning that, during the work of alteration and repair in various parts of the building, the clay sketches, drawings, and paintings executed during a long time past by the competitors for the Prix de Rome, should not be injured or destroyed. These works constitute in fact a highly interesting collection, many of them signed by names which have since become famous. Mention may be specially made of an equestrian figure executed by Regnault when a pupil in the school.——The occasion of the visit of the Czar is to be taken to inaugurate the new Hôtel de Ville of Dunkerque, designed by M. Louis Cordonnier of Lille; a fine building in the style of the Flemish Renaissance.——The jury in the competition for a circus theatre at Troyes have awarded the first premium to M. Henri Schmidt, the second to M. André Bérard, the third to M. Emile Robert, and the fourth to M. Bruno-Pelissier—all of Paris.

MISCELLANEOUS.

PUBLIC IMPROVEMENTS, FULHAM.—The Fulham Board of Guardians have passed resolutions consenting (1) To the provision of increased boiler accommodation, the erection of a chimney at the workhouse, and to the execution of works and the provision of machinery and apparatus for the purpose of lighting by electricity the workhouse, infirmary, and board offices of the parish, in accordance with plans to which the Local Government Board have affixed their seal, subject, nevertheless, to such modifications as the Local Government Board might direct. (2) To the expenditure for the above purposes of a sum not exceeding 11,111*l.* (3) To the borrowing of such an amount or such part as might be necessary.

A NEW THEATRE, HAMMERSMITH.—It is stated that, with the concurrence of the Charity Commissioners, a site has been taken for the building of a theatre at the corner of Rowan-road and the main road, Hammersmith, upon land which belongs to the trustees of a charitable endowment.

PUBLIC HEALTH (LONDON) ACT, 1891; PROPOSED AMENDMENT.—From the Report of Dr. J. King Warry, M.D., on the Sanitary Condition of the Hackney District for the year 1900, we make the following extracts:—My experience of the last few years shows that there is need for some amendment of the Public Health Act, which will enable Local Authorities to deal more promptly with recalcitrant owners of property in respect to the cleansing of rooms, especially those occupied by the working and lower classes. To the credit of the majority of property owners most of the cleansing is done on the service of a notice by the Local Authority; but there is a certain class of owners who will not do such work unless by a magistrate's order. At present, in order to obtain a magistrate's order to cleanse the walls and ceilings of an occupied room, it is necessary to take it as a general nuisance under Section 2 of the Public Health (London) Act as a nuisance, or dangerous, or injurious to health. It is extremely difficult to prove that a dirty ceiling or wall is dangerous or injurious to health in any special sense. Certainly cleanliness of dwelling, as well as person, is essential to good health, and when they are so dirty that they give rise to a stuffy or unwholesome smell, they tend to lower the vitality of the inmates. But the Local Authority should have the power of dealing with this before it reaches the condition to injuriously affect the health of the occupants in a similar way to that in which factories, or workshops, or bakehouses are periodically cleansed. The law is adequate to deal with the cleansing of these. Tenements, houses registered under the by-laws for houses let in lodgings are also required to be cleansed thoroughly once a year by the landlord. Now this provision of annual cleaning should be applied to every house occupied by the working classes; if not, these houses ought to at least be put on as high a sanitary level as workshops under the Public Health Act (London), 1901, that is that the cleansing of any room should be compulsory on the certificate of a Medical Officer of Health. If this amendment of the law could be effected, the work of the Local Authority in dealing with dirty rooms would be much simplified and made more effectual.

ALL SAINTS' CHURCH, DALSTON.—The fire that broke out a few days ago caused serious injury to the fabric and equipment of the church. The official report sets forth that one-third of the ground floor and the gallery, with their contents, are severely damaged by fire; 90 ft. of roofing are damaged by fire and cutting away, and the rest of the building and its contents are damaged by heat, smoke, water, and breakage. The church was begun after Hardwick's designs and consecrated on July 4, 1856; the aisles were built and galleries were added afterwards by Mr. Knightley, so as to increase the capacity of the church to that for 1,500 persons. The organ was by Willis, 1857.

STREET IMPROVEMENT, HULL.—The scheme of street improvement which the Right Hon. Walter

Long, President of the Local Government Board, will formally inaugurate in the middle of next month is the greatest and most important undertaken by the Hull Corporation. To reach Prospect-street from Monument Bridge people had to travel round by way of Waterworks-street and Chariot-street. Through the centre of the block of property facing Monument Bridge a fine road 80 ft. in width has been driven, and an uninterrupted vista from the bridge to Beverley-road corner, nearly a mile in length, now meets the eye. Not a few old streets, containing old, worthless, insanitary property, have been completely demolished and their names taken off the street nomenclature of the city. The sites of the new street, so soon to be known as King Edward-street, have realised large prices, several about 50*l.* per square yard, as the thoroughfare will undoubtedly take front rank in the business avenues of Hull. Another improvement which will be commenced in 1902 is the demolition of the Junction-street and St. John-street block of buildings, and the formation of a great central square, measuring 272 ft. from north to south, and 216 ft. from east to west. This open square will be in the heart of the city, and a little over an acre in extent. The scheme also provides for the erection of thirty-four shops of varying frontages, and the provision of a public hall, with retiring-rooms, together with three large reception halls. The expenditure upon land and buildings in connexion with this improvement is estimated at 92,000*l.* The present gross rental of the property, which belongs to the Corporation, is 4,861*l.* After the improvement is completed, it is estimated that the Corporation coffers will be enriched by an additional annual sum of 3,872*l.*—*Leeds Mercury.*

THE LAND REGISTRY.—The annual returns prepared at the Land Registry, Lincoln's-inn-fields, cover the twelve months ended with March 31 last. The report sets forth that, whilst no registrations have been effected under the Small Holdings Act of 1892, there were 19,885 separate titles on the register at the close of last year under the Land Transfer Act of 1875 and the Land Registry Act of 1862; the total number of transactions registered during the year 1900 was 19,678, and their value (where ascertainable) was 24,401,753*l.* The fees received during the period of twelve months in the Land Registry amounted to 53,802*l.*, the salaries and expenses to 38,393*l.*; the salaries and expenses in respect of the working of the Land Transfer Acts of 1875 and 1897 amounted to about 32,800*l.*, and the receipts from fees under those Acts to 37,600*l.* In the year 1900 were registered on first registration the titles to 2,585 freehold estates, valued at an aggregate of 7,181,651*l.*; on December 31 last there were 2,820 separate titles on the register, and the total number of separate titles that had been removed from the 1862 register on that date (otherwise than by transfer to the 1875 register) was 270, representing about 86 acres out of a total area of 49,117 acres, valued at 5,346,437*l.*

FULHAM WORKHOUSE TO BE LIGHTED BY ELECTRICITY.—The Local Government Board has sanctioned the scheme of the Fulham Guardians for engineering works at the infirmary, and for lighting by electricity the offices, workhouse, and infirmary. At the last meeting of the Guardians it was decided to instruct Mr. Medhurst (the engineer) to prepare the necessary specification of works, plans and forms of tender, the estimate being 10,220*l.* Mr. W. R. Sayer said that the expenditure would result in a saving to the ratepayers, and that it would be cheaper for the Guardians to make their own current than to take it from the Borough Council.

THE SANITARY INSTITUTE.—A donation of 100*l.* has been promised by the Leeds Fireclay Company to the fund for the new Building and Endowment Fund of the Parkes Museum.

GREENCOAT TECHNICAL CLASSES, CAMBERWELL.—The technical and art classes, held at the Greencoat School, Camberwell Green, S.E., will resume work for the winter session on Monday, September 23. These classes are in affiliation with the Technical Education Board of the London County Council, the City and Guilds Institute, and the Board of Education. Of late their usefulness has been considerably increased by the help of the Technical Education Board's grants in aid of equipment. By this means a valuable collection of models and apparatus has been provided for the use of students employed in the building trade.

WINDOW, ST. PETER'S CHURCH, STAINES.—A large seven-light stained-glass east window and a small three-light side window have recently been placed in St. Peter's Church, Staines. They are from the designs and cartoons of Mr. E. Fellowes Prynne, brother of the architect of the church, Mr. George Fellowes Prynne, and have been carried out by Mr. James Jennings. The subject of the large window is the "Church Triumphant," and of the small one "The Nativity and Adoration of the Magi and Shepherds."

CAPITAL AND LABOUR.

BUILDING TRADE DISPUTE AT BATH.—About one hundred masons and bricklayers employed by Messrs. Jacob Long & Sons, of Bath, have left work, refusing to labour with five men who have incurred penalties under the Operative Masons and Bricklayers' Union which they refuse to pay. The men required that they should either pay up or that Messrs. Long should discharge them, and they also demanded that the employers should agree henceforth to employ only society men. The employers, of course, refused, and called upon the assistance of the Master Builders' Association, who at a recent meeting passed the following resolution:—"That the members of this Association condemn the coercive action of the executive of the Operative Masons and Bricklayers' Union in compelling their members to strike on account of the employment by Messrs. Jacob Long & Sons of non-union men, and consider such action as an unjustifiable breach of the working rules mutually agreed upon on June 13, 1901, and that unless the strikers return to work by 9 a.m. on Friday next, September 13, and comply with the same working rules, the members of this Association will reluctantly lock out the union masons and bricklayers in their employment, and take such steps as they may be advised to retain the right as hitherto to employ union and non-union men without distinction." The resolution was communicated to the men. There are about 400 masons and bricklayers in Bath, and something like 1,500 or 1,600 men are engaged in the whole building trade, which would be at a standstill in the event of a strike.—The men, acting on advice from the headquarters of the trade-union, have returned to work.

THE BUILDING TRADE DISPUTE IN BRADFORD.—It may now be taken for granted that the dispute in the Bradford building trade, which commenced nearly five months ago, has passed beyond the probability of any other settlement than that resulting from the gradual introduction of non-union labour into the places previously filled by union labour in Bradford, and the removal of the unionists to other towns where no quarrel of the kind is in an active state. Masters and union men alike decline to "budge" from the positions which they have taken up, and neither party has now any desire for intervention. The employers state that they are rapidly filling up all vacancies with non-union workmen, are quite satisfied with the quality of the new men, and do not intend to have relationships with the trades unions concerned at any future time. The labour bureau which has been conducted by Mr. W. A. Forshaw for some weeks past in the interests of the Building Trade Federation is intended to be a permanent institution for the registering of individual workmen. Application for joiners' places now have to be refused, wallers are plentiful, banker hands and general labourers are coming forward freely, and masons (though not yet numerous enough to satisfy all requirements) have presented themselves in sufficient numbers to justify the hope that in a couple of weeks or so there will be no remaining vacancies. The slight deficiency of masons, of course, hinders the work of other departments in which the workmen follow on in the ordinary course of building; but, by an interchange of men, the employers are keeping the work which is of actual importance going on well. It is expected, for instance, that the work in connexion with the Cartwright Memorial Hall will be in full swing in the course of another week. The foregoing represents the employers' view of the position, and the representatives of the displaced trades union workers would not seriously traverse this statement except in two or three respects. The trades union officials hold that the imported non-union labour is inefficient and unsatisfactory, and, though it may triumph for a time, will be beaten out again in the long run. Their opinion is that the employers are acting with the support, and really in the interests, of the National Federation of Master Builders, whose habit it is to select what they regard as a weak labour centre from the trades union point of view, and make some sacrifice in order to turn out the union labour for a time. The unionists appear to look upon the resultant displacement with perfect equanimity, as a matter in relation to which time will work out its revenges. The Amalgamated Society of Carpenters and Joiners has 67,000 members, of whom only 1,200 are out of work by reason of strikes and lockouts throughout the country. The society, having large accumulated funds, can continue paying displaced members for an indefinite period, and has, in fact, increased the rate of remuneration to these men recently. The masons are similarly well provided for, having a powerful society with ample funds at its back, enabling them to snap their fingers at any action which the employers may take. The labourers also have their own society, which is keeping them in fairly comfortable condition. All the union men prefer to transfer their homes to some other city or town rather than give way to the masters' demands, because in their opinion compliance with these requirements here would encourage the National Federation to open the attack elsewhere.—*Bradford Observer.*

LEGAL.

CASE UNDER THE 1894 BUILDING ACT.

MR. CHARLES ANSELL, builder, of Chicheley-street, York-road, was summoned recently at North London Police-court by Mr. Payne, District Surveyor for East Hackney, for that in doing certain work at the Brunswick Arms public-house, Hackney, he acted contrary to the London Building Act of 1894. Mr. Wootten, barrister, defended.—Mr. Payne's case was that the defendant had placed a new flap to the cellar of the public-house without giving him notice as District Surveyor, and had used in the construction deal instead of some hard and incombustible material.—Mr. d'Eyncourt said a cellar flap could not be made of anything but wood. The Act of Parliament, moreover, gave them no ground to go upon, and the summons would be dismissed, with 3*l.* 3*s.* costs.

ANCIENT LIGHT DISPUTE AT WAKEFIELD.

THE case of Archers, Limited, *v.* Elvey, came before the Lord Chief Justice of England sitting as Vacation Judge on the 18th inst., on a motion by the plaintiffs for an interim injunction to restrain the defendant from building so as to interfere with the plaintiffs' ancient lights.

Counsel in support of the application stated that the plaintiffs' property was a lodge on the Plumpton House Estate, Wakefield, and by a wall which the defendant was erecting the light coming to the windows of the lodge, which was now used as an office, would be materially affected.

His lordship stated that he had read the affidavits filed, and asked Mr. Compston, the learned counsel appearing for the defendant, if his client would give an undertaking to pull down at the trial if the judge held that the plaintiffs were right?

Mr. Compston said he could not do so, because there were reasons why his lordship should not interfere at this stage of the case. If there was any interference with the plaintiffs' light it was of the most trivial character.

The plaintiffs' counsel stated that the injunction was claimed on two points: firstly, that the lights were ancient; and, secondly, that even if they were not, the defendant could not block them, because he conveyed the property in question to the plaintiffs with the then existing unobstructed lights, and he was now derogating from his part by building on his own land and obstructing the light.

In the result his lordship directed that the defendant must be restrained from building further until the trial, and granted an interim injunction in those terms. He also directed that the trial should be expedited, and that the costs of the application should be costs in the cause.

RECENT PATENTS:

ABSTRACTS OF PATENTED INVENTIONS.

9,047.—A ROAD-SWEEPING MACHINE AND ELEVATOR: *W. H. Melvin and A. Mann.*—The mud and other refuse is swept into a trough at the top of an inclined plate by means of a rotating brush upon a frame carried by side-wheels upon an axle and a front-wheel upon a swivelling front carriage. The refuse is conveyed by a screw that turns in the trough into a receiver whence a screw lifts it up to a swivelling spout for discharge; chain-gearing from a side wheel of the frame drives the brush and the conveying-screw in the trough, and a chain and bevel gearing drives the screw which raises the mud out of the trough; in another form bearings adjusted with screws carry the brush and the shaft. The receiver or casing is fitted with a manhole, and scrapers upon chains around sprocket-wheels convey the mud up the inclined plate of which the lower portion slides upon the upper portion which a spring forces against the road.

9,113.—A WOOD-MORTISING MACHINE: *J. Thomson.*—A crank-handle and a train of gearing move a sprocket-wheel which drives the pitch-chain to which the cutters are affixed. A screw feeds forwards a sliding frame which carries the chain. The cutters are set so as to project in turn from opposite sides of the chain and are adjusted with a slot and a screwed pin. For increasing the length of the cut mortise, one separates guide-rollers that sustain the forward end of the chain, and forces apart, with a wedge, the hinged arms upon the ends of which the guide-rollers are mounted.

9,120.—CONSTRUCTION OF FLOORS: *J. C. Pellon and L. E. Mosher.*—Perforated metal sheets, that may be wrapped around anchoring rods at their edges are employed for strengthening the concrete, or similar, blocks, and wedge-shaped supporting blocks made of concrete layers applied to sheets of fire-proof fabric are fitted between metal beams or guides, the plastic layers being folded around perforated strips or cores of sheet-metal. The blocks can then be pressed into the required shapes, and their shoulders will hold up the flooring and ceiling blocks. Bent wires may be used for suspending the ceiling, and a skeleton of metal rods and strips will serve to strengthen the blocks.

9,128.—DREDGING APPARATUS: *A. F. Smulders.*—A rotary pump raises the soil and lowers the end of a pipe on to which a shut-off valve is fitted, and by means of a reversing valve the soil will be discharged through a pipe on to the bank or through another pipe into the barge. The barge is emptied by the closing of a valve and the reversal of the reversing valve and of an auxiliary valve.

9,131.—PIPE MOULDING: *C. J. Kielberg.*—A tube, upon which is mounted a screw, slides upon a rotating or fixed core. When the screw is at its lowest position the cement is poured into the mould cylinder where it may be compressed by screwing the tube upwards through it. By this invention the movable core and compression screw specified in No. 18,353 of 1899 are dispensed with.

9,149.—A PACKING FOR JOINTS: *C. H. Merwarth and F. Conlin.*—A packing for pipe-joints and similar objects consists of two wire rings (for which washers can be substituted upon occasion), of which the inner one is made of a soft metal and the outer one of some harder metal; there are strips—to be wound around a pair of bolts—for facilitating the centering of the packing.

9,215.—APPLIANCES FOR PILE-DRIVING AND DEEP-BORING MACHINERY: *C. L. S. Isler and H. F. Broadhurst.*—Cams and gearing from the shaft drive a lever, to which the rope around the head-pulley is passed; a screw and a split feeding-nut feed out the rope, ratchet gear and a hand-lever near the pivot of the lever serving to drive the screw, whilst an adjustable block varies the leverage.

9,229.—ELECTRICAL TESTS AND RESISTANCES: *Willans & Robinson and G. L. Addenbrooke.*—For testing polyphase or single alternating-current meters, transformers, and generators, &c., are devised loads formed of non-inductive resistances and variable inductances connected parallel wise. A variable inductance is composed of strip or wire coiled through laminated iron frames which are disposed in radial arrangement about a common non-magnetical centre, and adjustable air-spaces in the circuits are formed by causing the ends or outer sides of the frames to be moved separately by means of slit holders and screws; in another variety two nuts which are linked to the outer sides of the frames are mounted upon a middle rotatable right-and-left-handed screw, whereby an adjustment at one and the same time will be effected, or one rectangular iron frame having one of its sides adjustable may be substituted.

9,275.—PROCESS OF HARDENING LIME OR ARTIFICIAL SANDSTONE: *P. Prior.*—For hardening the raw building material the inventor mixes it with alkalies or their salts—say, potassium carbonate or sodium carbonate—and then exposes the compound to superheated steam under high pressure, or he first volatilises the alkali and mingles it with the superheated steam, or causes the steam to pass over alkali laid in pierced pans within the hardening vessel.

9,289.—FIXING OF FENCING-WIRE: *J. Webb.*—A wire-straining appliance has arms hinged together and upon them are mounted pivoted clamps, of which the ends are serrated to a curve which is eccentrical as regards the pivots. When the clamps are turned the wires become gripped between the serrations on the ends of the clamps, and serrations upon the hinged arms, which are worked with a nut and screw or a screwjack; hooked and bolted clips fasten the looped ends of the wires.

9,342.—A SPRING HINGE FOR DOORS: *A. L. Stump and F. Brucker.*—A plate fastens a socket to the door-frame, and to the outer end of the socket is secured one end of the spring—its other end being set so as to bear against a sliding plate which is to be drawn out with one of two pins attached to a socket upon the double swing-door, when the door is quite opened one of the pins will pass into a rebate in the outer end of the door-frame socket, and so keep the door in that position.

9,354.—MATERIALS FOR BRAZING: *A. Vogt.*—After the objects have been coated with a protecting composition, and (as to their surfaces which are to be joined) a solution of water-glass and borax, they are heated and then put into the molten brazing material. For the composition an admixture is made of carbon, hydrated oxide of iron, with powdered asbestos or steatite, and (if needed) an aluminium oxide, together with beer, glue solution, or some such binding agent.

9,361.—A STAFF FOR LEVELLING PURPOSES: *G. Hilscher.*—In order to simplify the process of "correcting" when the staff has been observed through the telescope, the inventor provides a staff which is marked with two sets of graduations, either way, from a zero line, and having behind it a graduated foot that will slide adjustably within staples. In correcting for the height of the telescope and for its angle of elevation when one seeks to ascertain the difference of level between two objects, the staff should be raised upon its foot until its zero is horizontal with the height of the telescope.

9,422-3.—MEANS OF EXTINGUISHING FIRE: *H. B. Febiger.*—For extinguishing fire with refrigerated gases the inventor causes some non-combustion-supporting gas to be drawn by a fan from a receiver into the refrigerating chamber, and thence into the closed apartment where the fire is. For cooling the chamber a charge of sulphurous dioxide, or ammonia, under pressure in a receiver is caused to flow through a pipe-coil into the chamber where it will mingle with the gas.

9,469.—ELECTRICAL ENERGY METERS: *A. Peloux.* In the case of an induction motor meter for single alternating currents and having a conducting disc or cylinder driven with a shunt magnet and main current coils displaced anglewise on opposite sides of the cylinder, the inventor contrives to minimise the retardation arising from eddy currents due to the increase of the main current coils when the main current is large. He either provides additional compensatory driving force by means of a second winding upon an electro-magnet, which a main current transformer supplies with current, or provides for keeping constant the total magnetical flow through the cylinder or disc. For the latter purpose he causes a rotating disc to be driven by the inter-action of an electro-magnet in a highly inductive shunt circuit and displaced coils, which are in non-inductive shunt circuits that contain the secondaries of two main current transformers. Other variant forms of the invention are specified.

9,481.—FITTINGS FOR MATHEMATICAL DRAWING INSTRUMENTS: *A. J. Thornton.*—For a firm attachment of a needle-point it is held by its extreme end only in a hole in the split socket at the end of the compass-leg, which is made of tempered steel; through a nut carried by a screw is passed the upper part of the needle, which will become secured when a milled nut is turned so as to draw the other nut into a recess cut in the leg.

9,487.—BEARINGS FOR PLUG-COCKS: *J. Glover and Royles, Limited.*—The invention relates more particularly to plug-cocks used under high pressure; a gland, embodying an auxiliary gland, holds the plug in its casing, and the plug bears against packing-rings; between the plug and the additional gland is inserted a ball-bearing formed of balls (or rollers) and rings; the bearing may be arranged at one or both of the ends of the plug.

9,492.—ELECTRICAL COUPLING AND DISTRIBUTION: *W. M. Douglas.*—Three pieces of metal, fitted with binding-screws, are used with a ceiling-rose or some similar connection, for a two-wire supply. Loops of the supply wires are connected with the first and second metal pieces, whilst the first and third pieces are connected with the lamp. Wires that connect the second and third pieces with a switch serve to complete the circuit. Insulating partitions keep the three pieces separated from one another. The couplings are specified as being available for connecting lamps upon two different circuits, and so on, and as rendering unnecessary the making of joints and long loops in the wires.

9,494.—PILE DRIVING, STAMPING, AND SIMILAR MACHINERY: *E. S. Brett.*—The inventor's object is to increase the travel of the head with the same extent of the oscillation of the driving-shaft. In the case of a pile-driver he mounts the piston of a rotary engine upon a driving-shaft of which the arms support a pulley which takes a bight of the rope, and when the arms are oscillated in one direction the head will be raised twice the distance which is moved by that pulley; the travel may be still further extended by using a pair of pulley blocks instead of only one. The inner end of the rope is passed over a pulley mounted above the piston and thence to a rope barrel having a pawl and ratchet-wheel for adjustment of the position of the head. Confer also No. 2,924 of 1890.

9,512.—TREATMENT OF SEWAGE, &C.: *E. W. Ives.*—A pipe conveys the sewage or foul water from a screening-chamber into a mixing-channel, beyond which is the settling-tank. The screening-cage has bars which break up some of the solids. Two pipes (which are joined to a short pipe upon which is mounted a set of distributing-arms) convey the sewage, &c., from the mixing-channel into the tank, of which the lower portion, cone-shaped, constitutes a sump for the sludge, into which water or air may be forced. Filtering-bodies receive the liquid portion of the sewage.

MEETINGS.

FRIDAY, SEPTEMBER 20.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. J. Priestley, B.A., on "Duties of a Sanitary Inspector: Indoor." 7 p.m.

SATURDAY, SEPTEMBER 21.

Sanitary Institute (*Demonstrations for Sanitary Officers*).—Inspection at Wimbledon Sewage Works. 3 p.m.

Northern Architectural Association.—Excursion meeting. Members to assemble at the south end of Sunderland Central Station, at 3.5 p.m., upon the arrival of the 2.32 p.m. train from Newcastle.

TUESDAY, SEPTEMBER 24.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. J. Priestley, B.A., on "Duties of a Sanitary Inspector: Offensive Trades and Trade Nuisances, &c." 7 p.m.

WEDNESDAY, SEPTEMBER 25.

Builders' Foremen and Clerks of Works' Institution.—Quarterly meeting of the directors. 8 p.m.

SATURDAY, SEPTEMBER 28.

Sanitary Institute (*Demonstrations for Sanitary Officers*).—Inspection at the Richmond Main Sewerage Pumping Station and Purification Works, Kew Gardens. 3 p.m.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

September 5.—By Messrs. KEMSLEY (at Birmingham).

Shrewley, Warwick.—Pinley Hill Farm, 86 a. 3 r. 31 p., f.	£2,600

By PERKINS & SONS (at Romsey).

Braishfield, Hants.—Wilkins Farm, 130 a., f. and c.	1,500
Pitt Farm, 114 a., f. and c.	1,070
Awbridge, Hants.—Yew Tree Farm, 75 a., f. and c.	2,257

By T. WALKER & SON (at York).

East Lilling, Yorks.—Thornton Cottage Farm, 248 a. 0 r. 33 p., f.	10,200
Thornton-le-Clay, Yorks.—A freehold residence and 7 a. 2 r. 21 p.	650
Flaxton, Yorks.—Three freehold closes, 11 a. 2 r. 27 p.	600
House, blacksmith's shop, and 11 a. 3 r. 37 p., f.	750
Freehold house and three cottages	515
York.—Monkgate, freehold warehouses, stabling, and yard	800

By Messrs. COBB (at Sheerness).

Sheerness, Kent.—74, 76, 78, and 80, High-st., area 6,230 ft., f.	2,320
35, 41, and 43, James-st., f.	535
7, 19, 29, 35, and 47, Clyde-st., f.	930
50 and 52, Broad-st., f.	200
105 to 119 (odd), Hope-st., f.	710
4A to 4E, Cross-st., f.	500

September 7.—By ROBERTS, SON, & TORY (at Blandford).

Melcombe Bingham, Dorset.—Cothayes Farm, 160 a. 2 r. 23 p., f.	3,150
Coombe Wood and enclosures, 115 a. 3 r. 29 p., f.	2,200
Links Plantation, &c., 39 a. 2 r. 28 p., f.	1,700

September 9.—By WILKINSON, SON, & WELCH (at Brighton).

Brighton, Sussex.—3, Norfolk-ter., f., r. 120*l.*	1,500
14, Eaton-pl., f.	855
12, Preston Park-avenue, f., r. 100*l.*	1,550
17, Beaconsfield-villas, f.	1,225

September 10.—By RUTLEY, SON & VINE.

Camden Town.—27, Rochester-rd., u.t. 42½ yrs., g.r. 5*l.*	510
Somers Town.—52, Barclay-st., u.t. 19 yrs., g.r. 2*l.* 10s.	200
Holloway.—39, St. John's Park, u.t. 50 yrs., g.r. 7*l.* 10s., r. 49*l.*	430

By WILLIS & CROUCH.

Hampstead.—26, Belsize-avenue, u.t. 70 yrs., g.r. 35*l.*, e.r. 135*l.*	1,000

By G. LOVEITT & SON (at Coventry).

Berkswell, Warwick.—The Railway Inn and two cottages adjoining, f., r. 33*l.* 10s.	2,300
Two freehold fields, 6 a. 2 r. 11 p.	360

By J. & W. JOHNSON & Co. (at Masons' Hall Tavern).

Ilford, Essex.—3 and 4, Grafton-villas, also the Grafton Stores (with off-licence), u.t, 36 and 46 yrs., r. 140*l.*	3,850

September 11.—By FULLER, HORSEY, SONS, & CASSELL.

Wandsworth.—Standen-rd., the Berrenberg Electric Lamp Factory, area 3,000 yards, u.t. 95½ yrs., g.r. 35*l.*, with goodwill, plant, machinery, &c.	4,000

By Messrs. CRONK.

Ightham, Kent.—Hazeldene and 3 a. 2 r. 5 p., f.	1,480
Fairview and 5 a. 0 r. 38 p., f.	1,500
A freehold cottage residence and 3 a. 2 r. 12 p.	900
Downe, Kent.—Orpington-rd., &c., five plots of freehold building land, 10 a. 2 r. 12 p.	1,055

By E. H. HENRY.

Clapham.—11, Park Hill, u.t. 56¼ yrs., g.r. 21*l.*, e.r. 70*l.*	385
31, Lilleshall-rd., u.t. 69 yrs., g.r. 4*l.* 15s. 6d.	450
Wandsworth.—45, Devereux-rd., u.t. 89 yrs., g.r. 10*l.*, r. 45*l.*	450

By DOUGLAS YOUNG & Co.

Battersea.—59, Lavender-rd., u.t. 38½ yrs., g.r. 3*l.* 10s., r. 25*l.*	230
Clapham.—13, Paradise-rd., f., r. 39*l.*	440
57, Paradise-rd., f., r. 39*l.*	445
Putney.—Upper Richmond-rd., f.g.r. 8*l.*, reversion in 89 yrs.	185

September 12.—By C. C. & T. MOORE.

Mile End.—260 and 262, Oxford-st., u.t. 22 yrs., g.r. 8*l.*	380
22 and 24, Apsley-st., u.t. 21 yrs., g.r. 7*l.*	350
8, Duckett-st., also the Black Horse b.-h., and 75 and 77, Skidmore-st., u.t. 13 yrs., g.r. 30*l.*, r. 92*l.* 8s.	160
Peckham.—8, Edith-rd., u.t. 63 yrs., g.r. 7*l.*, e.r. 40*l.*	350

By MARK LIELL & SON.

Bow.—34 and 36, Ford-st., f.	480
3 and 5, Caxton-st., u.t. 50 yrs., g.r. 7*l.* 10s.	600

By MARTEN & CARNABY.

Dulwich.—5, 6, 7, and 8, Uxbridge-villas, u.t. 79 yrs., g.r. 26*l.*, r. 120*l.*	1,050

***Contractions used in these lists.*—F.g.r.** for freehold ground-rent; **l.g.r.** for leasehold ground-rent; **i.g.r.** for improved ground-rent; **g.r.** for ground-rent; **r.** for rent; **f.** for freehold; **c.** for copyhold; **l.** for leasehold; **e.r.** for estimated rental; **u.t.** for unexpired term; **p.a.** for per annum; **yrs.** for years; **st.** for street; **rd.** for road; **sq.** for square; **pl.** for place; **ter.** for terrace; **cres.** for crescent; **yd.** for yard.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered
Cottages	Roscommon (Ireland) R.D.C.	Not stated	Sept. 21

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c., Supplied by	Tenders to be delivered
Sewerage Works, near Uppingham	Hallaton R.D.C.	Coales & Johnson, Engineers, Market Harborough	Sept. 24
Road Works, Annan Bridge	.....	W. Tait, Town Offices, Moffat, N.B.	do.
Villa, Norham, near Berwick-on-Tweed	.....	J. L. M. Sherriff, East House, Norham	do.
Vicarage, Field Broughton	.....	Wright & Son, Surveyors, Lancaster	do.
*Pipe Surface Water Drain	Willesden District Council	O. Claude Robson, Engineer, Dyne-road, Kilburn, N.W.	do.
*Electricity Works	do.	do.	do.
*Making-up Roads	Tottenham U.D.C.	Engineer to Council, Offices, 712, High-road, Tottenham	do.
Paving Works	Middlesbro Corporation	F. Baker, Civil Engineer, Municipal Offices, Middlesbro'	Sept. 25
Sewers	Marlborough (Wilts) Town Council	E. L. Gwillim, Town Offices, Marlborough	do.
Workhouse Alterations	Mitford, &c., Guardians	J. B. Pearce, Architect, Norwich	do.
Reservoir, near Dumbarton	.....	Kyle & Frew, Engineers, 140, West George-street, Glasgow	do.
Additions to Asylum, Rainhill	Lancs Asylums Board	J. Gornall, County Asylum, Rainhill	Sept. 23
Waterworks	Bude (Cornwall) U.D.C.	B. Latham, Civil Engineer, Victoria-street, S.W.	do.
Railway Stores	Great Indian Peninsular Ry. Co.	J. J. Berry, Copthall House, Copthall-avenue, E.C.	do.
*Private Street Works	Tunbridge Wells Council	Borough Surveyor, Town Hall, Tunbridge Wells	do.
Water Main, Deganwy	Conway (N. Wales) Town Council	Borough Engineer, Town Hall, Conway	Sept. 27
Roads, Muswell Hill, N.	.....	Vigers & Co., 4, Frederick's-place, E.C.	do.
14 Houses, Pellon, Halifax	.....	M. Hall, Architect, 29, Northgate, Halifax	do.
Sewers	Barnsley R.D.C.	W. J. Lomax, Engineer, 11, Fold-street, Bolton	do.
*New Coastguard Buildings, Whitstable	Admiralty	Coastguard Station, Whitstable	do.
Sewerage Works	Lutterworth R.D.C.	W. H. Simpson, Civil Engineer, Leicester	Sept. 28
Additions to Destructor Works	Blackpool Corporation	J. S. Brodie, Borough Engineer, Town Hall, Blackpool	do.
Tramways, &c.	Reading Corporation	J. Bowen, Civil Engineer, Town Hall, Reading	do.
*Alterations to Parish Church, Pelsall, Staffs	.....	T. H. Fleeming, 102, Darlington-street, Wolverhampton	do.
*North-East London Institute	The Governors	A. W. Cooksey, Esq., 4, Adam-street, Adelphi, W.C.	Sept. 30
*Blue Paving Bricks, &c.	Edmonton U.D.C.	G. Eedes Eachus, Engineer, Town Hall, Edmonton	do.
Isolation Hospital, Menston, Yorks	.....	Blackwell & Thomson, Architects, Leicester	do.
Sewers	Hale (Cheshire) U.D.C.	F. J. Lobley, Civil Engineer, Albert-road, Hale, Cheshire	do.
Reconstructing Buildings, Union-street, Glasgow	Caledonian Railway Company	J. Miller, Architect, 15, Blythswood-square, Glasgow	do.
School, &c., Wilson-street	Bristol School Board	Munro & Son, Architects, Baldwin-street, Bristol	do.
Fencing Works	Hornsea (Yorks) U.D.C.	W. G. Warburton, Surveyor, Hornsea	do.
Granite Setts	Heaton Norris U.D.C.	W. Hodson, Council Offices, near Stockport	do.
*Workmen's Dwellings	Wellington (Salop) U.D.C.	Clerk to Council, Church-street, Wellington, Salop	Oct. 1
Sewers	Bradford-on-Avon U.D.C.	S. Howard, Surveyor, Town Hall, Bradford-on-Avon	do.
Cemetery Chapel	Great Yarmouth Town Council	J. W. Cockrill, Surveyor, Town Hall, Great Yarmouth	do.
Drainage Works	Banffshire County Council	J. Barron, Civil Engineer, 1, Bon Accord-street, Aberdeen	do.
*School	Hornchurch School Board	S. J. Adams, Weston-road, Southend	Oct. 2
School	Brynmawr School Board	F. Baldwin, Architect, 13, Frogmore-street, Abergavenny	do.
Pumping Plant, &c	Littlehampton U.D.C.	H. Howard, Engineer, Town Offices, Littlehampton	do.
*Coastguard Buildings, Bexhill	Admiralty	Coastguard Station, Bexhill	Oct. 4
*Sewerage Works	Bideford Corporation	Baldwin Latham, Engineer, Parliament Mansions, Victoria-street	Oct. 5
Water Supply Works	Monaghan U.D.C.	J. H. M. Wilson, Civil Engineer, Monaghan	do.
Sewers	Bideford Corporation	B. Latham, Civil Engineer, 17, Victoria-street, S.W.	do.
*New Generating Station at Greenhill	Oldham Corp. Electricity Dept.	A. Andrew, Gas and Water Offices, Oldham	Oct. 8
*Public Baths and Library	Sheffield Health Committee	C. F. Wike, City Surveyor, Town Hall, Sheffield	do.
*Tar-paving Materials	London County Council	Parks Department, 11, Regent-street, S.W.	do.
Hospital, Leigh-road, Pontypool	.....	R. Williams, Architect, 10, Clifford's-inn, Fleet-street, E.C.	Oct. 10
*New Visiting Rooms	Wilts County Asylum	County Surveyor, County Offices, Trowbridge	Oct. 12
*New Ward at Workhouse	Lambeth Guardians	Fowler & Hugman, Surveyors, 9, Craig's-court, Charing Cross	Oct. 15
*Laying-out and Building New Cattle Market	Braintree U.D.C.	A. & H. J. Cunnington, Great-square, Braintree	do.
*Town Hall	Cheltenham Corporation	Town Clerk, Municipal Offices, Cheltenham	Oct. 30
House, Ripon	.....	J. Young & Co., Architects, Market-street, Bradford	No date
40 Houses, Western Valleys, Mon.	.....	C. T. Evans, Architect, 8, Queen-street, Cardiff	do.
Engine House, &c., Meltham, Yorks	.....	W. Carter, Station-street, Meltham	do.
Kerbing, Skipton, Yorks	.....	W. H. Hutchinson, Embsay, Skipton	do.
Nine Houses, Dovercourt, near Harwich	.....	R. G. Kestin, 1, Colosseum-terrace, London, N.W.	do.
House, Canon Park Estate, Edgware	.....	H. M. Lawson, Architect, 49, Broadway, Ealing	do.
*Furniture for New Schools	Croydon School Board	The Clerk, School Board Office, Croydon	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*Architectural Assistant	Coventry Corporation	Not stated	Sept. 23
*Three Building Inspectors	Tottenham U.D.C.	150*l.* per annum each	Sept. 24
*Clerk of Works	Middlesbrough School Board	3*l.* per week	Sept. 26
Clerk of Works	Carlton (Yorks) Parish Council	2*l.* 10*s.* per week	Sept. 27
*Clerk of Works	Derby Corporation	Not stated	Oct. 1
County Surveyor	North Riding County Council	Not stated	No date

Those marked with an asterisk (*) are advertised in this Number. *Competitions, p. —.* *Contracts, pp.* lv. vi. viii. x. & xxii. *Public Appointments, pp.* xix. & xxii.

PRICES CURRENT OF MATERIALS.

**** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£	s.	d.		
Hard Stocks	1	14	0	per 1,000	alongside, in river.
Rough Stocks and Grizzles	1	11	0	,,	,, ,,
Facing Stocks	2	12	0	,,	,, ,,
Shippers	2	8	0	,,	,, ,,
Flettons	1	8	6	,,	at railway depôt.
Red Wire Cuts	1	14	6	,,	,, ,,
Best Fareham Red	3	11	0	,,	,, ,,
Best Red pressed Ruabon Facing	5	5	0	,,	,, ,,

PRICES CURRENT (*Continued*).

BRICKS, &c.

	£	s.	d.			
Best Blue Pressed Staffordshire	4	4	6	per 1,000	at railway depot.	
Do., Bullnose	4	9	0	,,	,,	,,
Best Stourbridge Fire Bricks	4	2	6	,,	,,	,,
GLAZED BRICKS						
Best White and Ivory Glazed Stretchers	13	0	0	,,	,,	,,
Headers	12	0	0	,,	,,	,,
Quoins, Bullnose, and Flats	17	0	0	,,	,,	,,
Double Stretchers	19	0	0	,,	,,	,,
Double Headers	16	0	0	,,	,,	,,

PRICES CURRENT (*Continued*).

BRICKS, &c.

	£	s.	d.			
One Side and two Ends	19	0	0	per 1,000	at railway depot.	
Two Sides and one End	20	0	0	,,	,,	,,
Splays, Chamfered, Squints	20	0	0	,,	,,	,,
Best Dipped Salt Glazed Stretchers and Headers	12	0	0	,,	,,	,,
Quoins, Bullnose, and Flats	14	0	0	,,	,,	,,
Double Stretchers	15	0	0	,,	,,	,,
Double Headers	14	0	0	,,	,,	,,
One Side and two Ends	15	0	0	,,		

PRICES CURRENT (*Continued*).

BRICKS, &c.

	£	s.	d.		
Two Sides and one End	15	0	0	per 1,000	at railway depot.
Splays, Chamfered, Squints	14	0	0	,,	,, ,,
Seconds Quality					
White and Dipped Salt Glazed	2	0	0	,,	less than best.

	s.	d.	
Thames and Pit Sand	7	3	per yard, delivered.
Thames Ballast	6	0	,, ,,
Best Portland Cement	34	6	per ton, delivered.
Best Ground Blue Lias Lime	25	6	,, ,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime	12s	6d.	per yard, delivered.
Stourbridge Fire-clay in sacks,	28s.	od.	per ton at rly. dpt.

STONE.

	s.	d.		
Ancaster in blocks	2	0	per ft. cube, deld. rly. depôt.	
Bath ,,	1	7	,,	,,
Farleigh Down Bath	1	8	,,	,,
Beer in blocks	1	6½	,,	,,
Grinshill ,,	1	10	,,	,,
Brown Portland in blocks	2	2	,,	,,
Darley Dale in blocks	2	1½	,,	,,
Red Corsehill ,,	2	5	,,	,,
Red Mansfield ,,	2	4½	,,	,,
Hard York in blocks	2	10	,,	,,
Hard York 6 in. sawn both sides landings, to sizes (under 40 ft. sup.)	2	8	per ft. super at rly. depôt	
,, ,, 6 in. Rubbed Ditto	3	0	,,	,,
,, ,, 3 in. sawn both sides slabs (random sizes)	1	3	,,	,,
,, ,, 2 in. self-faced Ditto	0	0½	,,	,,
Hopton Wood (Hard Bed) in blocks	2	3	per ft. cube. deld. rly. depôt	
,, ,, ,, 6-in sawn both sides landings	2	7	per ft. super. deld. rly. depôt.	
,, ,, ,, 3-in. do.	1	2½	,,	,,

SLATES.

In. in.	£	s.	d.		
20×10 best blue Bangor	11	5	0	per 1000 of 1200 at rly. dep.	
,, best seconds ,,	10	15	0	,,	,,
16× 8 best ,,	6	2	6	,,	,,
20×10 best blue Portmadoc	10	18	0	,,	,,
16× 8 best blue Portmadoc	6	0	0	,,	,,
20×10 best Eureka unfading green	11	2	6	,,	,,
16× 8 ,, ,,	6	15	0	,,	,,
20×10 Permanent green	10	0	0	,,	,,
16× 8 ,, ,,	5	12	6	,,	,,

TILES.

	s.	d.		
Best plain red roofing tiles	41	6	per 1,000 at rly. depôt	
Hip and valley tiles	3	7	per doz.	,, ,,
Best Broseley tiles	48	6	per 1,000	,, ,,
Hip and valley tiles	4	0	per doz.	,, ,,
Best Ruabon Red, brown or brindled Do. (Edwards)	57	6	per 1,000	,, ,,
Do. ornamental Do.	60	0	,,	,, ,,
Hip tiles	4	0	per doz.	,, ,,
Valley tiles	3	9	,,	,, ,,
Best Red or Mottled Staffordshire Do. (Peakes)	50	9	per 1,000	,, ,,
Hip tiles	4	1	per doz.	,, ,,
Valley tiles	3	8	,,	,, ,,

WOOD.

BUILDING WOOD.—YELLOW.

	At per standard. £	s.	d.	£	s.	d.
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in.	14	10	0	16	10	0
Deals: best 3 by 9	13	10	0	14	10	0
Battens: best 2½ in. by 7 in. and 8 in. and 3 in. by 7 in. and 8 in.	11	0	0	12	0	0
Battens: best 2½ by 6 and 3 by 6	0	10	0	less than 7 in. and 8 in.		
Deals seconds	1	0	0	less than best		
Battens: seconds	0	10	0	,, ,,		,,
2 in. by 4 in. and 2 in. by 6 in.	9	0	0	10	10	0
2 in. by 4½ in. and 2 in. by 5 in.	9	0	0	10	0	0
Foreign Sawn Boards— 1 in. by 1½ in. by 1½ in.	0	10	0	more than battens.		
¾ in.	1	0	0	,,		
Fir timber: Best middling Danzig or Memel (average specification)	At per load of 50 ft.					
Seconds	4	10	0	5	0	0
Small timber (8 in. to 10 in.)	4	5	0	4	10	0
Swedish balks	3	12	6	3	15	0
Pitch pine timber (35 ft. average)	2	15	0	3	0	0

JOINERS' WOOD.

	At per standard. £	s.	d.	£	s.	d.
White Sea: First yellow deals, 3 in. by 11 in.	3	0	0	26	0	0
3 in. by 9 in.	22	0	0	23	0	0
Battens, 2½ in. and 3 in. by 7 in.	18	0	0	20	0	0
Second yellow deals, 3 in. by 11 in.	20	0	0	21	0	0
,, ,, 3 in. by 9 in.	18	0	0	19	0	0
Battens, 2½ in. and 3 in. by 7 in.	14	0	0	15	0	0
Third yellow deals, 3 in. by 11 in. and 9 in.	14	10	0	15	10	0
Battens, 2½ in. and 3 in. by 7 in.	12	0	0	12	10	0
Petersburg: first yellow deals, 3 in. by 11 in.	22	0	0	23	0	0
Do. 3 in. by 9 in.	19	0	0	20	0	0
Battens	14	0	0	15	0	0
Second yellow deals, 3 in. by 11 in.	15	10	0	16	10	0
Do. 3 in. by 9 in.	14	0	0	15	0	0
Battens	11	10	0	12	0	0
Third yellow deals, 3 in. by 11 in.	13	10	0	14	10	0
Do. 3 in. by 9 in.	13	0	0	13	10	0
Battens	10	10	0	11	10	0
White Sea and Petersburg:— First white deals, 3 in. by 11 in.	15	0	0	16	0	0
,, ,, ,, 3 in. by 9 in.	14	0	0	15	0	0
Battens	12	0	0	13	0	0
Second white deals 3 in. by 11 in.	14	0	0	15	0	0
,, ,, ,, 3 in. by 9 in.	13	0	0	14	0	0
,, ,, battens	10	10	0	11	10	0

PRICES CURRENT (*Continued*).

WOOD.

JOINERS' WOOD.

	At per standard. £	s.	d.	£	s.	d.
Pitch pine: deals	16	0	0	18	0	0
Under 2 in. thick extra	0	10	0	1	0	0
Yellow Pine— First, regular sizes	30	0	0	33	0	0
Broads (12 in. and up)	2	0	0	more.		
Oddments	22	0	0	24	0	0
Seconds, regular sizes	24	10	0	26	10	0
Yellow Pine Oddments	20	0	0	22	0	0
Kauri Pine—Planks, per ft. cube	0	3	6	0	4	6
Danzig and Stettin Oak Logs— Large, per ft. cube	0	2	6	0	3	0
Small ,, ,,	0	2	3	0	2	6
Wainscot Oak Logs, per ft. cube	0	5	0	0	5	6
Dry Wainscot Oak, per ft. sup. as inch	0	0	8	0	0	7
in. do. do.	0	0	7	-	-	-
Dry Mahogany— Honduras, Tabasco, per ft. sup. as inch	0	0	9	0	0	11
Selected, Figury, per ft. sup. as inch	0	1	6	0	2	0
Dry Walnut, American, per ft. sup. as inch	0	0	10	0	1	0
Teak, per load	16	0	0	20	0	0
American Whitewood Planks— Per ft. cube	0	3	0	0	3	6
Prepared Flooring—	Per square					
1 in. by 7 in. yellow, planed and shot	0	13	6	0	16	6
1 in. by 7 in. yellow, planed and matched	0	13	6	0	17	6
1¼ in. by 7 in. yellow, planed and matched	0	16	0	1	1	0
6 in. at 6d. per square less than 7 in.						
1 in. by 7 in. white, planed and shot	0	11	0	0	13	0
1 in. by 7 in. white, planed and matched	0	11	6	0	13	6
1¼ in. by 7 in. white, planed and matched	0	14	0	0	16	6
6 in. at 6d. per square less than 7 in.						

JOISTS, GIRDERS, &c.

	In London, or delivered to Railway Vans, per ton. £	s.	d.	£	s.	d.
Rolled Steel Joists, ordinary sections	6	15	0	7	15	0
Compound Girders ,, ,,	8	15	0	10	0	0
Angles, Tees and Channels, ordinary sections	8	12	6	10	12	6
Flitch Plates	8	15	0	9	10	0
Cast Iron Columns and Stanchions, including ordinary patterns	7	5	0	9	0	0

METALS.

	Per ton, in London. £	s.	d.	£	s.	d.
IRON.— Common Bars	8	0	0	8	10	0
Staffordshire Crown Bars, good merchant quality	8	10	0	9	0	0
Staffordshire "Marked Bars"	10	10	0	-	-	-
Mild Steel Bars	9	0	0	9	10	0
Hoop Iron, basis price	9	5	0	9	15	0
,, ,, galvanised	16	0	0	-	-	-
(* And upwards, according to size and gauge.)						
Sheet Iron, Black.— Ordinary sizes to 20 g.	10	0	0	-	-	-
,, ,, to 24 g.	11	0	0	-	-	-
,, ,, to 26 g.	12	10	0	-	-	-
Sheet Iron, Galvanised, flat, ordinary quality.— Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.	12	10	0	-	-	-
,, ,, 22 g. and 24 g.	13	0	0	-	-	-
,, ,, 26 g.	14	0	0	-	-	-
Sheet Iron, galvanised, flat, best quality.— Ordinary sizes to 20 g.	16	10	0	-	-	-
,, ,, 22 g. and 24 g.	17	0	0	-	-	-
,, ,, 26 g.	18	10	0	-	-	-
Galvanised Corrugated Sheets.— Ordinary sizes, 6 ft. to 8 ft. 20 g.	12	10	0	-	-	-
,, ,, 22 g. and 24 g.	13	0	0	-	-	-
,, ,, 26 g.	14	0	0	-	-	-
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. by 20 g. and thicker	12	5	0	-	-	-
,, ,, 22 g. and 24 g.	13	5	0	-	-	-
,, ,, 26 g.	14	5	0	-	-	-
Cut nails, 3 in. to 6 in. (Under 3 in. usual trade extras.)	9	10	0	10	0	0

LEAD, &c.

	Per ton, in London. £	s.	d.	£	s.	d.
LEAD—Sheet, English, 3 lbs. & up.	14	17	6	-	-	-
Pipe in coils	15	7	6	-	-	-
Soil Pipe	17	17	6	-	-	-
ZINC—Sheet— Vieille Montagne ton	24	10	0	-	-	-
Silesian	24	0	0	-	-	-
COPPER— Strong Sheet per lb.	0	1	0½	-	-	-
Thin ,,	0	1	2	-	-	-
Copper nails ,,	0	1	2	-	-	-
BRASS— Strong Sheet ,,	0	0	11	-	-	-
Thin ,,	0	1	1	-	-	-
TIN—English Ingots ,,	0	1	4½	-	-	-
SOLDER—Plumbers' ,,	0	0	7	-	-	-
Tinmen's ,,	0	0	8	-	-	-
Blowpipe ,,	0	0	9	-	-	-

PLASTER, &c.

	s.	d.	
Coarse Plaster	30	6	per ton delivered.
Fine ,,	47	6	,, ,,
Superfine ,,	88	6	,, ,,
Coarse Keenes and Parian cement	55	0	,, ,,
Fine do. do.	75	0	,, ,,
Robinson's Fireproof Cement	50	0	,, ,,
Do. Fine white, finishing (Exclusive of the ordinary charge for sacks.	55	0	,, ,,
Whiting	27	0	to 30 0 ,, ,,
Cow hair for plastering	£9	0	0 ,, ,,

PRICES CURRENT (*Continued*).

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	3d.	per ft.	delivered.
,, ,, fourths	2¾d.	,,	,,
21 oz. thirds	3¾d.	,,	,,
,, ,, fourths	3½d.	,,	,,
26 oz. thirds	5d.	,,	,,
,, ,, fourths	4½d.	,,	,,
32 oz. thirds	6d.	,,	,,
,, ,, fourths	5½d.	,,	,,
Fluted sheet, 15 oz.	3½d.	,,	,,
,, ,, 21 ,,	4½d.	,,	,,
½ Hartley's Rolled Plate	3d.	,,	,,
⅝ ,, ,, ,,	3½d.	,,	,,
¾ ,, ,, ,,	4d.	,,	,,

OILS, &c.

	£	s.	d.
Raw Linseed Oil in pipes per gallon	0	2	10
,, ,, ,, in barrels ,,	0	2	11
,, ,, ,, in drums ,,	0	3	1
Boiled ,, ,, in pipes ,,	0	3	0
,, ,, ,, in barrels ,,	0	3	1
,, ,, ,, in drums ,,	0	3	3
Turpentine, in barrels ,,	0	2	3
,, in drums ,,	0	2	5
Genuine Ground English White Lead ...per ton	22	0	0
Red Lead, Dry ,,	22	10	0
Best Linseed Oil Putty per cwt.	0	9	0
Stockholm Tar per barrel	1	10	0

VARNISHES, &c.

	per gallon £	s.	d
Fine Elastic Copal Varnish for outside work	0	16	6
Best Elastic Copal Varnish for outside work	1	0	0
Best Elastic Carriage Varnish for outside work	0	16	0
Best Hard Oak Varnish for inside work	0	10	6
Best Extra Hard Church Oak Varnish for inside work	0	10	6
Fine Hard Copal Varnish for inside work	0	16	0
Best Hard Copal Varnish for inside work	1	0	0
Best Hard Carriage Varnish for inside work	0	16	0
Extra Pale Paper Varnish	0	12	0
Best Japan Gold Size	0	10	6
Best Black Japan	0	16	0
Oak and Mahogany Stain	0	9	0
Brunswick Black	0	8	6
Berlin Black	0	16	0
Knotting	0	10	0
Best French and Brush Polish	0	10	0

TO CORRESPONDENTS.

NOTE.—The responsibility of signed articles, letters, and papers read at meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursdays.* N.B.—We cannot publish tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of tenders accepted unless the amount of the tender is given, nor any list in which the lowest tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BRENTWOOD.—For drainage and sanitary work at the Hackney Schools, Brentwood, for the Guardians of the Hackney Union. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

	£	Time.
Doulton & Co.	2,300	6 months.
W. J. Clark	2,193	—
Davis & Bennett	2,100	3½ months.
West	1,887	4 ,,
Hoinville	1,750	3 ,,
Gibb & Co.*	1,649	4 ,,

[Architect's estimate, £1,950.]

DAGENHAM (Essex).—Accepted for the erection of new school at Marsh Green, for the Dagenham School Board. Messrs. Harrington & Ley, architects, 65, Bishopsgate-street Without, E.C., and Corn Exchange, Romford:—

Hawkins & Son, Peterborough £5,317 10

DARLINGTON.—For the erection of eleven houses, Woodlands-terrace, for Mr. W. Waterson. Mr. Frank Martin, architect, South End Chambers, Darlington. Quantities by architect:—

Johnson & Boyd	£4,422 0	Veitch & Johnson, Darlington*	£3,723 0
J. Jenkins	3,963 10		
Boyd & Sons	3,835 0		

[See also next page.

DARTFORD.—For three Lancashire boilers, with pumps and other work, in the boiler-house at Joyce Green Hospital, for the Metropolitan Asylums Board. Messrs. A. & C. Harston, architects, 15, Leadenhall-street, E.C. :—

D. Adamson & Co...	£4,125	Anderton & Sons ..	£3,625
J. Adamson & Co. ..	4,040	Oldham Boiler Co...	5,586
Musgrave & Sons ..	4,027	Arnott & Co.	3,500
Tinkers, Ltd	3,987	J. Thompson	3,400
Holdsworth & Sons..	3,927	E. Danks, Birmingham*	3,400
Yates & Thom.....	3,916		
Moorwood & Sons..	3,775		

GRAVESEND.—For the erection of an electric light station, &c., for the Town Council. Mr. F. T. Grant, Borough Surveyor, Town Hall, Gravesend :—

Shelbourne & Co.	£8,342 0 0	Thomas & Edge	£7,697 0 0
Johnson & Sons	8,237 0 0	Wallis & Son	7,557 0 0
Beal & Hubbard	8,176 18 6	Hughes & Stirling	7,553 0 0
Smith & Son..	8,175 0 0	Multon & Wallis	7,533 0 0
F. G. Minter	8,030 0 0	F. & E. Davey, Southend-on-Sea*.....	7,094 0 0
J. Lonsdale ..	7,837 0 0		

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HOMERTON.—For repairs and redecoration to cottages in Sydney-road, for the Guardians of the Hackney Union. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C. :—

Barrett & Power	£402 0 0	Silk & Son	£285 0 0
W. J. Clark....	333 0 0	Starling & Son*	248 0 0
G. Moore	287 10 0	Gibb & Co.	247 0 0

[Architect's estimate, £250.]

HOVE.—For the execution of road works, &c., Julian and Melville roads, for the Borough Council. Mr. H. H. Scott, Borough Surveyor, Town Hall, Hove :—

Parsons & Sons, 118, Church-road, Hove*.. £251

[Julian-road, £172; Melville-road, £79.]

LONDON.—For Baptist Church, Lewin-road, Streatham, S.W. Messrs. George Baines and Reginald Palmer Baines, architects, 5, Clement's Inn, Strand, W.C. :—

Prestige & Co. ..	£4,347 0	Turtle & Appleton	£3,639 0
Geo. Parker	4,344 0	T. D. Leng.....	3,624 0
F. & H. F. Higgs	4,300 0	J. O. Richardson	3,536 0
Holliday & Greenwood	4,089 0	Battley, Sons, & Holness	3,515 0
Mattock Bros. ..	4,076 0	Johnson & Co., Ltd., Belle Vue-road, Wandsworth Common, S.W.*	3,354 10
Higgs & Hill....	3,890 0		
F. S. Minter	3,799 0		
Lascelles & Co...	3,661 0		
S. J. Scott.....	3,660 0		
Chessum & Son	3,657 0		

[Architects' estimate, £3,650.]

LUTON.—For stabling, workshops, van-shed, &c., at rear of Nos. 8 and 10, Manchester-street, for Mr. T. Sworder. Mr. A. Wilkinson, architect :—

Cain & Co.	£1,875 12	T. & E. Neville....	£961 0
G. Kingham	1,353 0	A. D. Batson.....	960 0
D. Parkins.....	1,107 0	G. W. Pryer	950 0
Godfrey & Rumbles	1,042 0	Turner.....	947 10
Mallet & Wood..	1,002 0	G. Smart.....	929 0
J. Tomkins.....	1,000 0	Taylor.....	827 18
G. Buckingham..	964 0	A. Mardle*	826 6

[All of Luton.]

NEW BROMPTON.—For the erection of school buildings for 1,230 children, to be known as the Richmond-road Schools, for the Gillingham and Grange Urban District School Board. Mr. H. Dighton Pearson, architect, 27, Chancery-lane, London, W.C. Quantities by Messrs. Leaning & Sons :—

Chessum & Sons	£15,074 0 0	T. J. Barden (Exors. of).	£12,545 0 0
Leslie & Co.	14,358 0 0	West Bros. ..	12,529 0 0
H. Flint	14,283 8 2	Wallis & Sons	12,385 0 0
C. Wall	14,160 0 0	H. E. Phillips	11,962 0 0
W. C. Snow	13,573 18 0	R. L. Tonge	11,730 0 0
F. G. Minter	13,271 0 0	Geo. Gates, Rochester*	10,800 0 0
W. Wallis ..	13,191 0 0		
Kirk & Kirk	12,736 2 0		
G.E.D. Woollard	12,570 0 0		

NEWMARKET.—For building new wall round the site of Newmarket Union Workhouse, according to specifications prepared by Messrs. Holland & Sons, architects, High-street, Newmarket :—

	Brick wall.	Cement concrete wall.
A. Spink	£408 11 6	£350 0 0
H. J. Linzell	343 0 0	312 0 0
Kerridge & Shaw	326 19 0	270 15 6
J. Cowell.....	310 0 0	297 0 0
H. Gray, Newmarket	*286 15 0	293 16 6
Architects' estimate ..	320 0 0	280 0 0

WALTON-ON-THAMES. — For the erection of stabling, &c., Crutchfield-lane, for the Urban District Council. Mr. C. J. Jenkin, C.E., architect, Council Offices, Walton-on-Thames. Quantities by architect :—

J. Lee	£2,894	R. Atkinson.....	£2,480
Newland-Higgs	2,799	Meredew & Co.	2,450
W. Greenfield	2,606	Gaze & Sons.....	2,395
Simpson & Co.	2,571	Redhill Joinery Co.	2,250
Shelbourne & Co. ..	2,563	C. Horsell, Weybridge, Surrey* ..	2,147
Hawkins & Co.	2,493		

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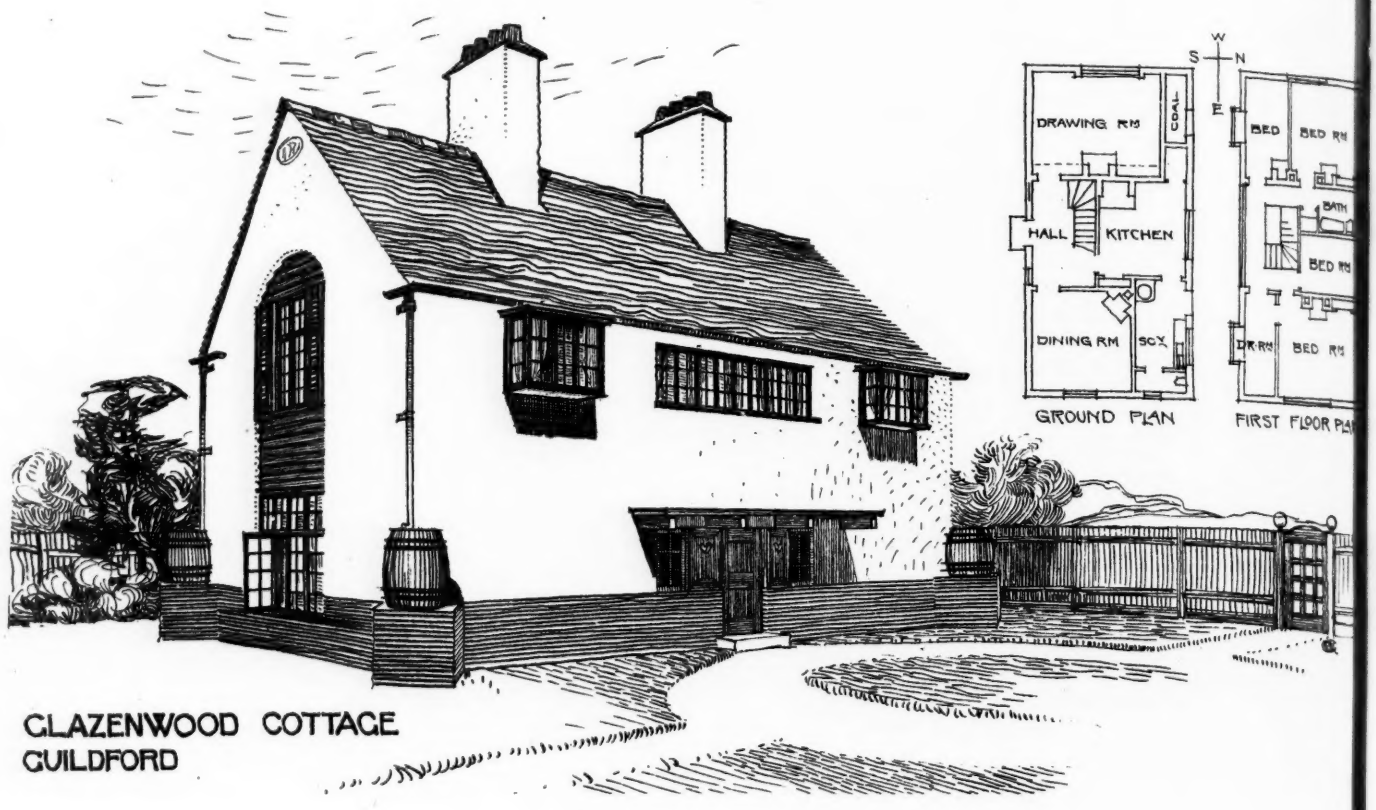

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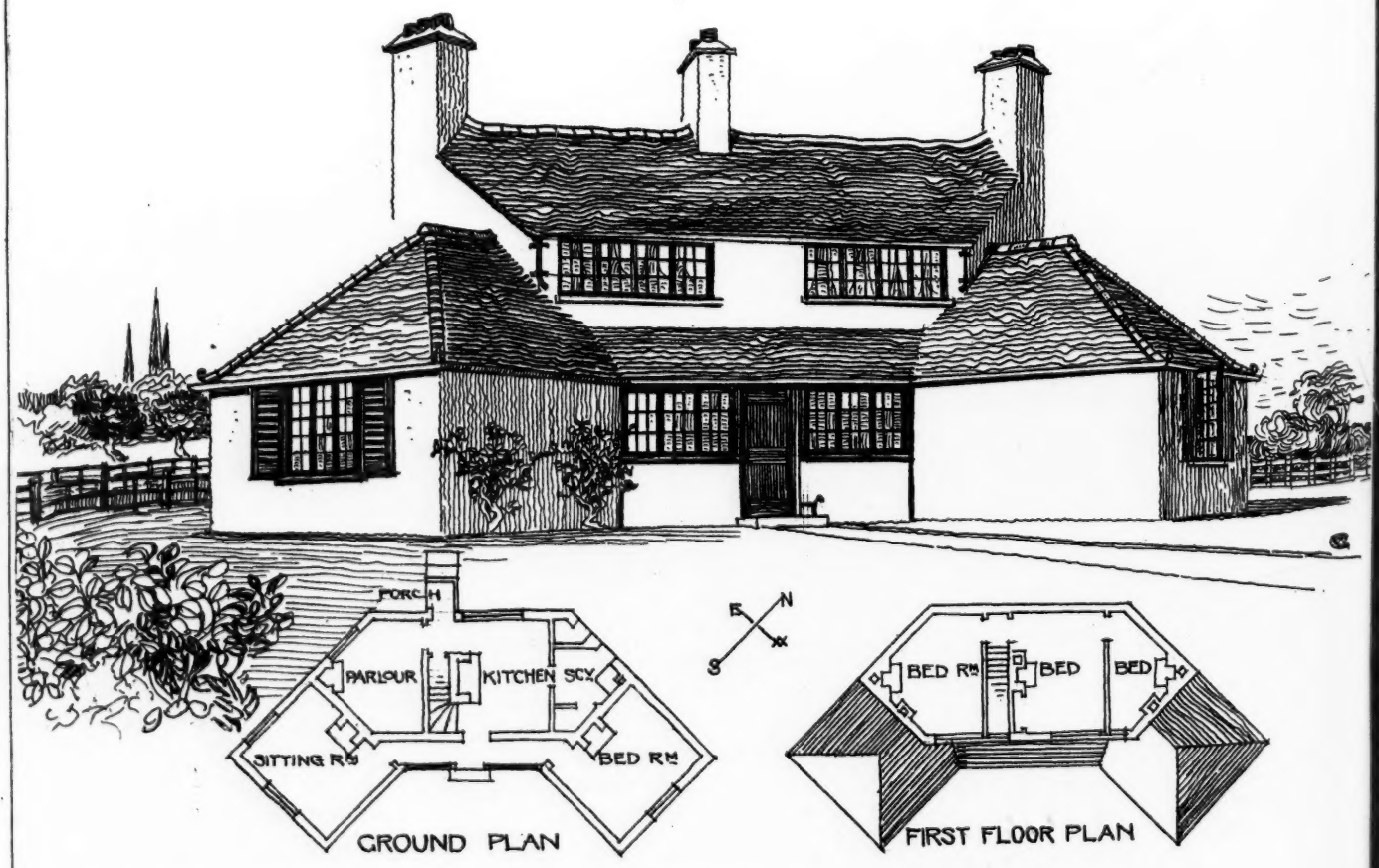

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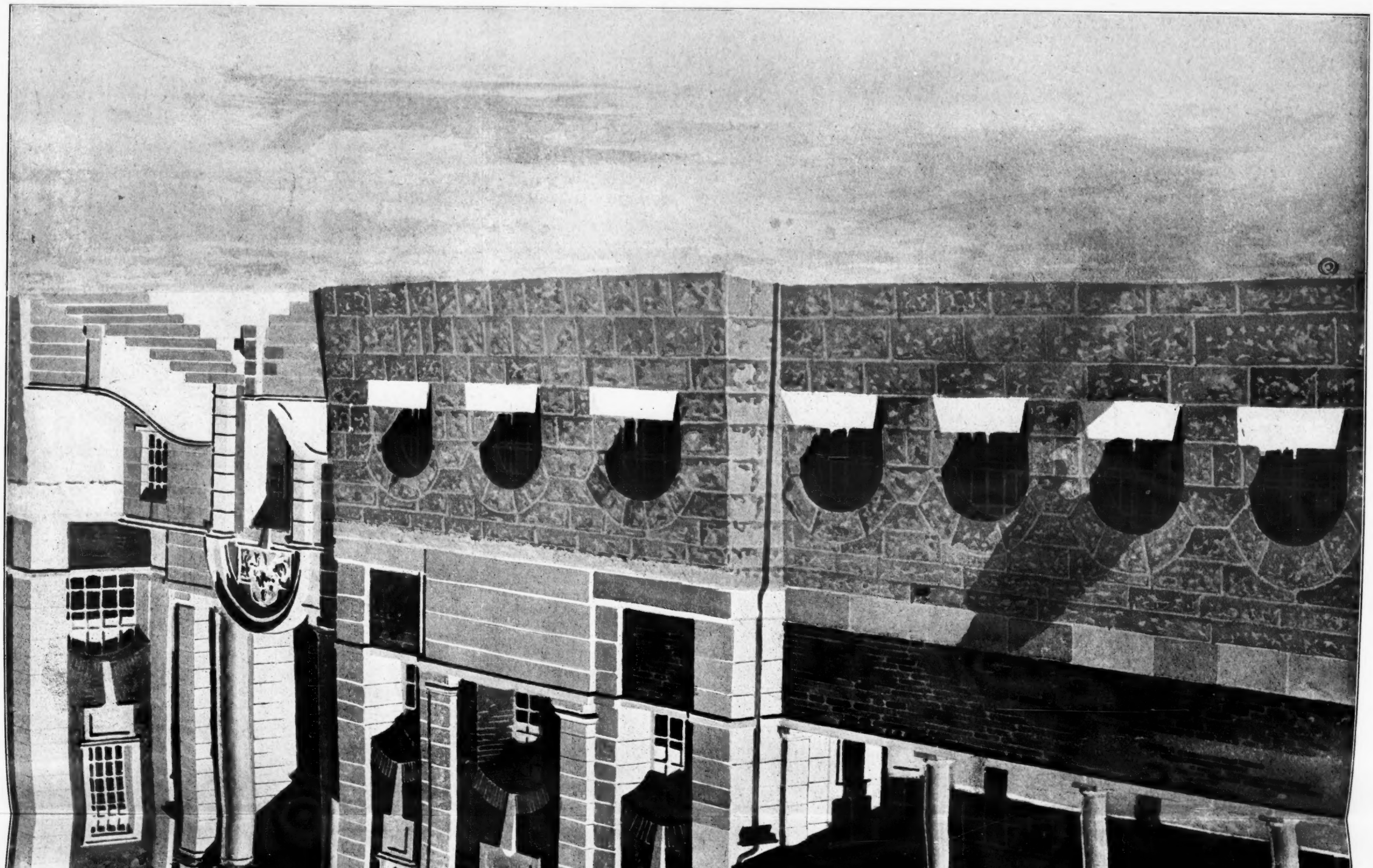

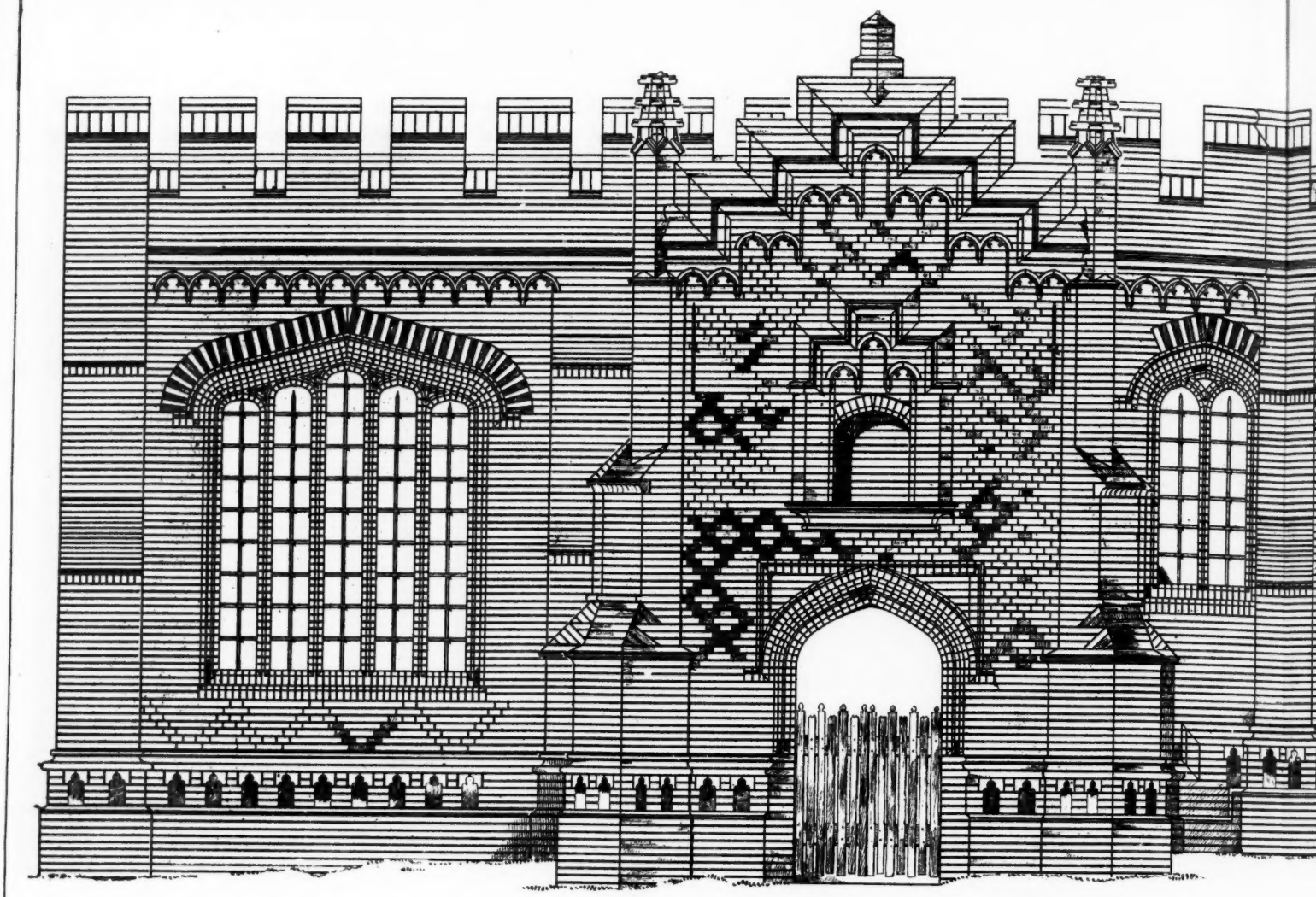

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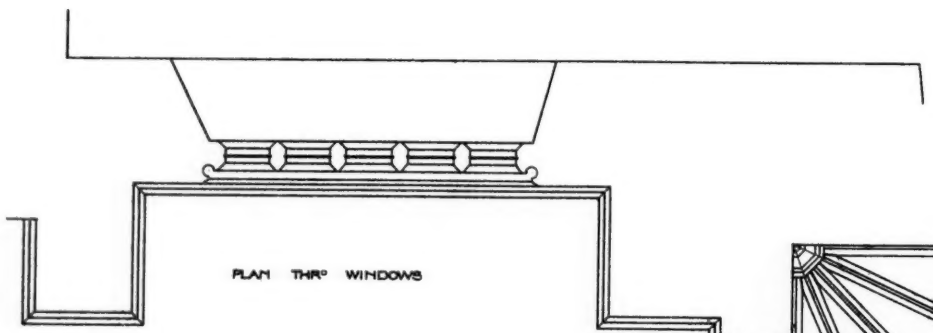

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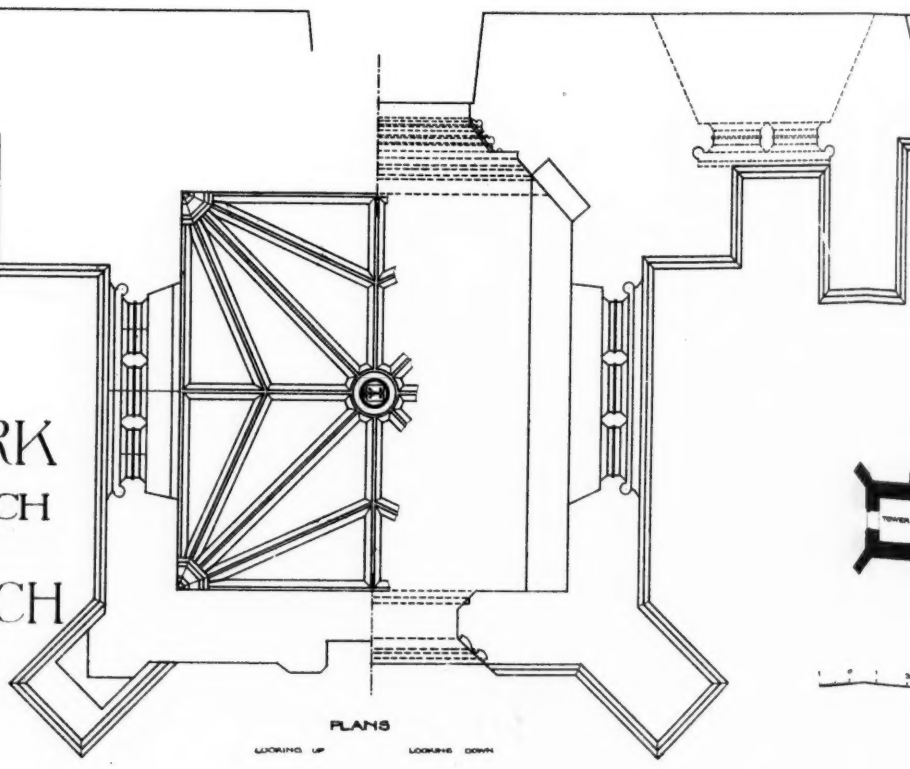

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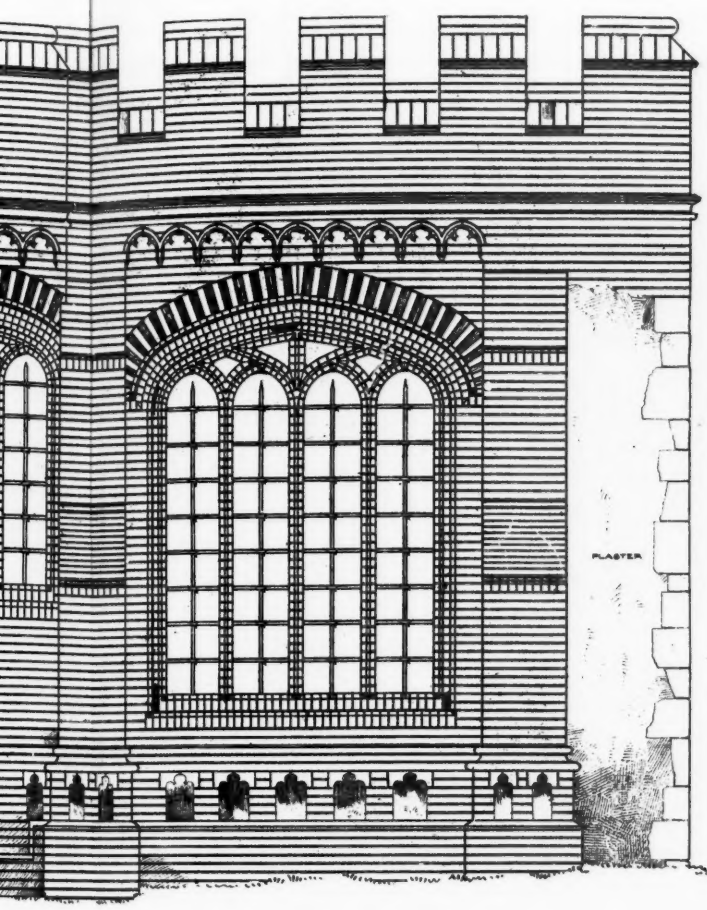
LOOKING UP LOOKING DOWN



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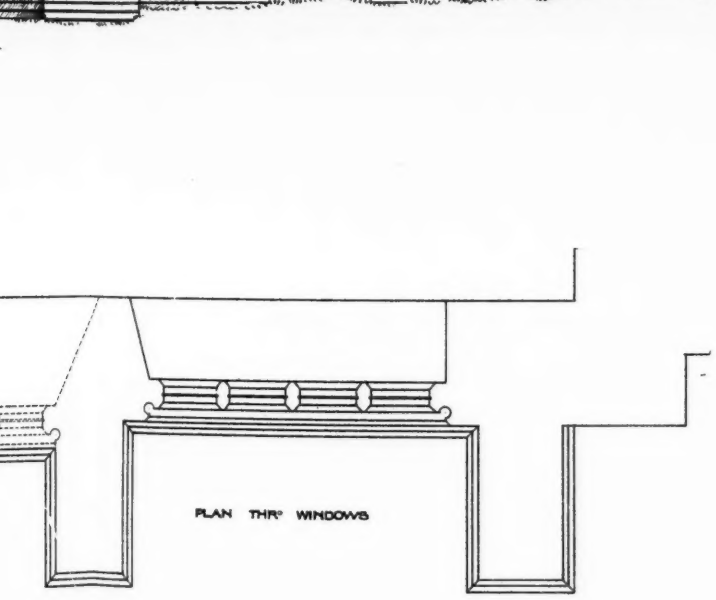

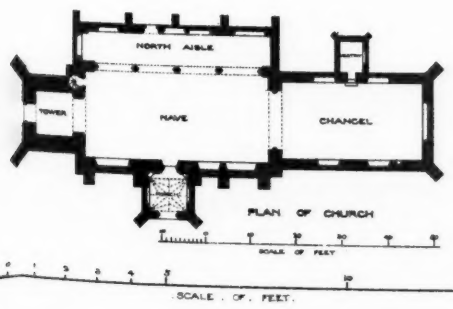

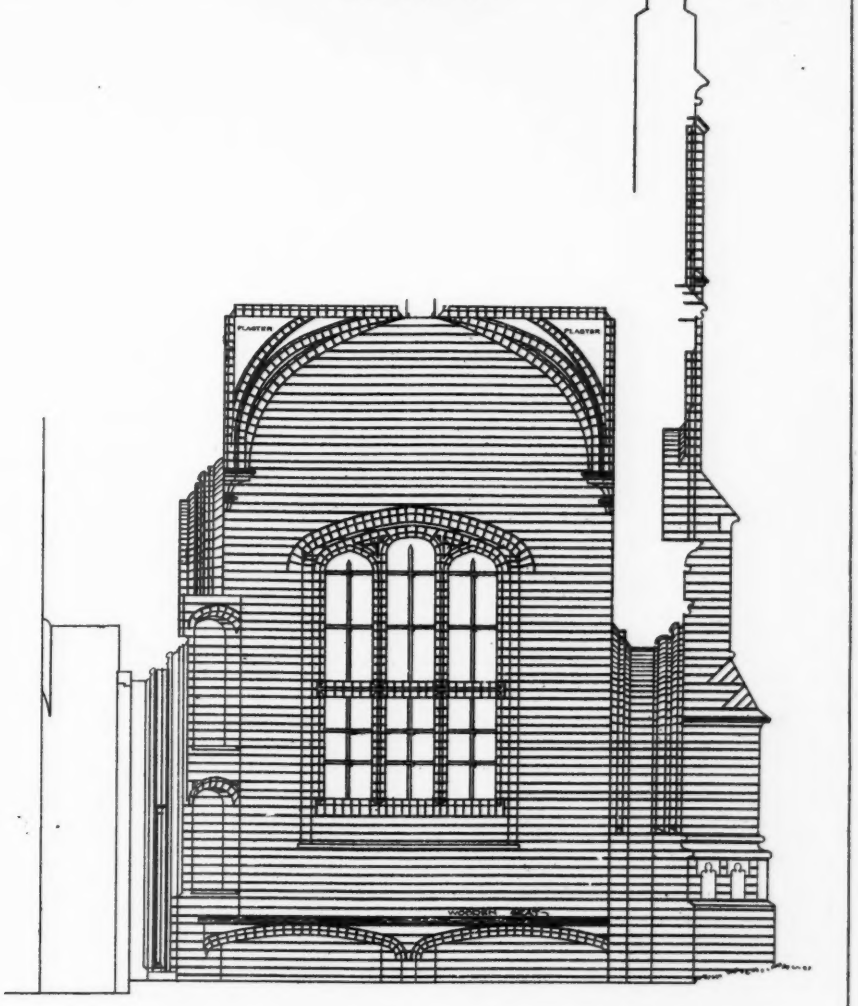

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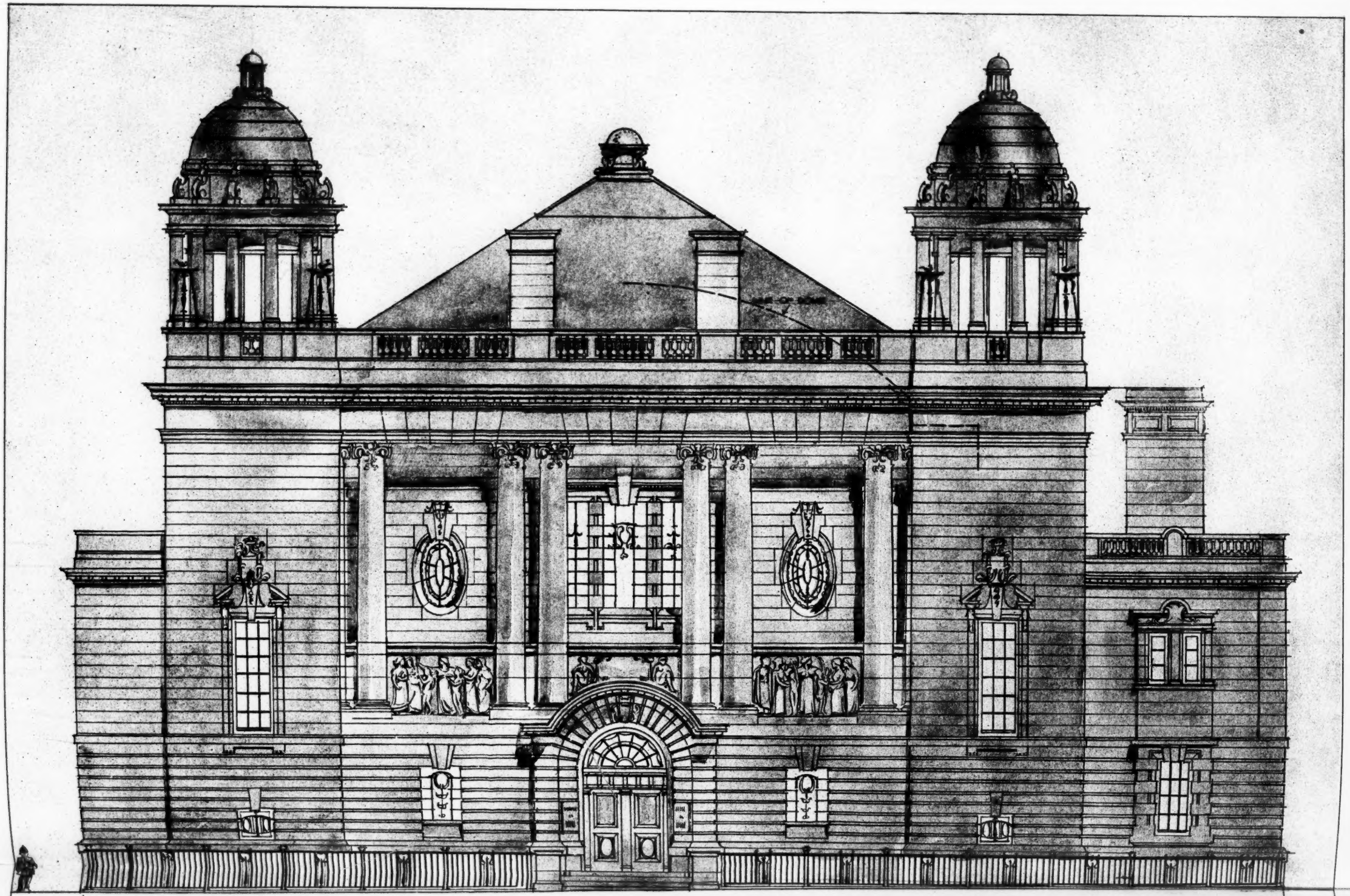

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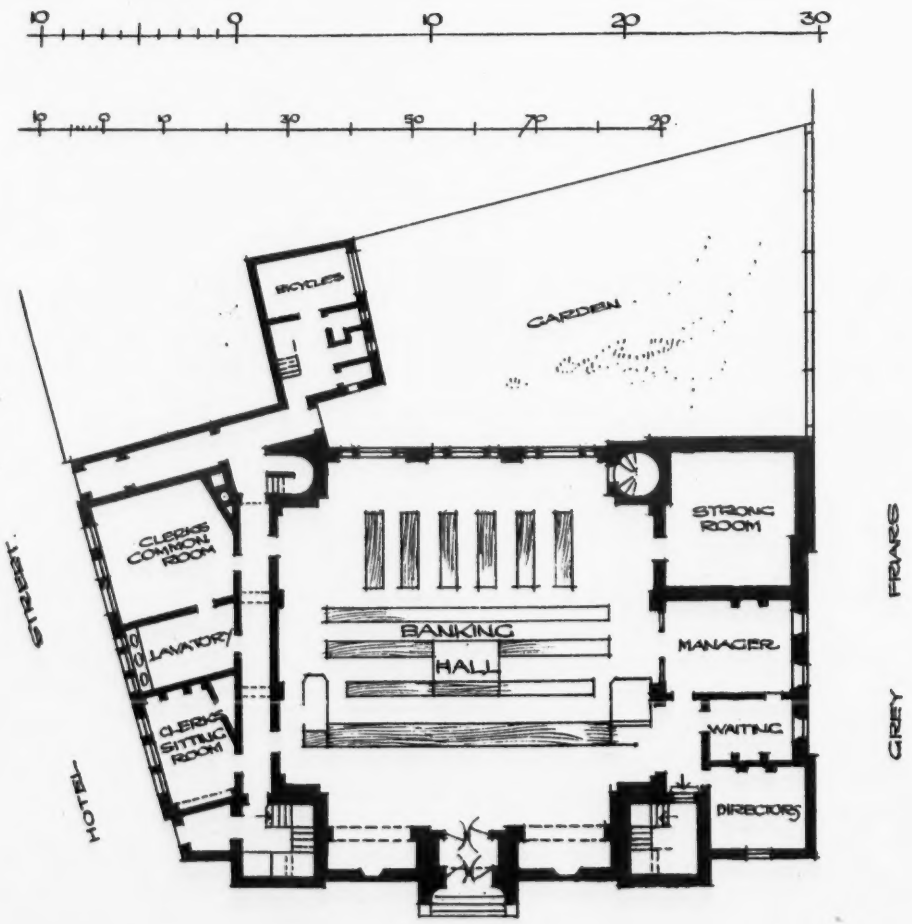

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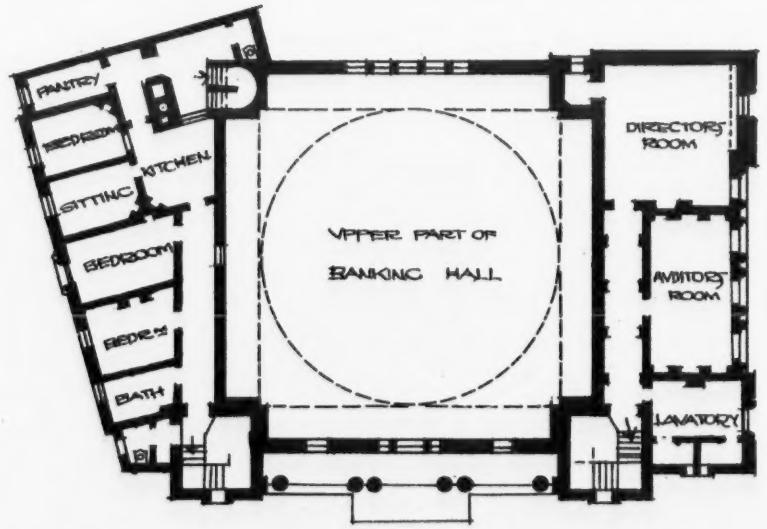

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